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FIRST GENERAL ADMINISTRATIVE REGULATION UNDER THE FEDERAL IMMISSIONS CONTROL ACT

Environmental Protection Agency
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FIRST GENERAL ADMINISTRATIVE REGULATION UNDER THE FEDERAL IMMISSIONS CONTROL ACT (Technical Instructions for Maintaining Air Purity -- Technical Committee on Air) OF AUGUST 28, 1974

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Pursuant to § 48 of the Federal Immissions Control Act (BImSchG) of March 15, 1974 (Federal Law Gazette I, pp. 721,1193), the Federal Government issues the following general administrative regulation after consultation with the Kreises involved, with the approval of the Bundesrat:

1. Technical Area of Application

These Technical Instructions for Maintaining Air Purity shall apply to those facilities falling under § 4 of the Federal Immissions Control Act to the extent that provisions of the Regulation on Facilities Requiring Approval pursuant to § 16 of the Industrial Code, in the version promulgated July 7, 1971 (Federal Law Gazette I, p. 888), apply in accordance with § 66, Par. 1, of the Federal Immissions Control Act for approval requirements. They contain provisions governing the maintenance of air purity which shall be observed by the responsible authorities

a) When examining applications for approval of the construction and operation of a facility (§§ 6 and 8, BImSchG) or for a significant change in the location, nature or operation of a facility (§ 15, BImSchG),

b) When examining the applications for the issuance of a preliminary decision (§ 9, BImSchG),

c) When issuing supplementary directives (§ 17, BImSchG), and

d) In directing the submission of reports on the nature and extent of emissions produced by a facility and immissions within the facility's area of influence (§ 26, BImSchG).

2. General Provisions on the Maintenance of Air Purity

2.1. Definitions and Units Used for Measurement

2.1.1. Air Pollutants

Air pollutants as defined in these instructions are changes in the natural composition of the air, particularly due to smoke, soot, dust, gases, aerosols, vapors or odorous materials; the vapors can include steam and water vapor.

2.1.2. Emissions

Emissions as defined in these instructions are the air pollutants originating from a facility.

Emissions shall be indicated as follows:

a) Mass of emitted materials referred to the volume

aa) of waste gas under standard conditions (0°C; 1013 mbar) after subtraction of the water vapor moisture content

bb) of waste gas (f) under standard conditions (0°C; 1013 mbar) prior to subtraction of the water vapor moisture content

as mass concentration in the unit mg/m^3;

b) Mass of emitted materials referred to time

as mass flow in the units kg/h or g/h;

c) Ratio of the mass of emitted materials to the mass of products generated or processed[1]

as mass ratio in the units kg/t or g/t.

Waste gases as defined in these instructions are carrier gases with solid, liquid and gaseous emissions.

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[1] Emission factors

The quantities of air which are fed to a system in the facility in order to dilute or cool the waste gas shall not be considered in determining mass concentration.

The grayness on Ringelmann's chart shall be used as the determining quantity for the optical evaluation of waste gas plumes.

2.1.3. Immissions

Immissions as defined in these instructions are air pollutants acting on humans, as well as animals, plants or other things. As a rule, air pollutants occurring at a height of 1.5 meters above the ground or at the upper limit of vegetation or at a distance of 1.5 meters from the surface of a building shall be considered active air pollutants.

Immissions shall be indicated as follows:

General --

Mass of air-polluting materials referred to the volume of polluted air as mass concentration in the units mg/m^3;

In addition, for gases --

Volume of air-polluting materials referred to the volume of polluted air as volume concentration in the units cm^3/m^3;

In addition, for dusts --

Number of dust particles referred to the volume of polluted air as dust particle concentration in the units $1/cm^3$;

As dust precipitation --

Mass of precipitated dusts referred to collection area and measurement time (sampling time)

as mass coverage per unit time in the unts $g/(m^2 d)$.

2.1.4. Symbols for Additional Units Used for Measurement

µm	micrometer	1 µm	=	1/1000 mm
km	kilometer	1 km	=	1000 m
µg	microgram	1 µg	=	1/1000 mg
mg	milligram	1 mg	=	1/1000 g
t	[metric] ton	1 t	=	1000 kg
h	hour	1 h	=	3600 s
d	day	1 d	=	24 h = 86,400 s
mbar	millibar	1 mbar	=	1/1000 bar = 100 Pa

kJ/h: kilojoule per hour (thermal power);

MJ/h megajoule per hour; 1 MJ/h = 1000 kJ/h;

GJ/h gigajoule per hour; 1 GJ/h = 1000 MJ/h;

TJ/h terajoule per hour; 1 TJ/h = 1000 GJ/h;

m^3/h cubic meter per hour (volume flow).

2.2. General Provisions Governing Approval, Preliminary Decisions and Supplementary Directives

2.2.1. Examination of Applications for Approval of the Construction and Operation of New Facilities

2.2.1.1. Approval conditions pursuant to § 6 of the Federal Immissions Control Act shall be considered satisfied, in terms of the maintenance of a i r purity, if

a) The facilities are equipped with systems for limiting emissions which correspond to the state of the art (2.3.1),

b) Immission values (2.4) are not exceeded within the facility's area of influence as the result of operation of the facility, and

c) Emissions are dispersed in accordance with 2.6.

2.2.1.2. Approval conditions shall also be considered satisfied, in terms of the maintenance of air purity, in those cases in which it is to be feared that the immission values will be exceeded and in which emissions are reduced or dispersed.

a) Through technical measures which go beyond the requirements for limiting emissions in 2.3.2 through 2.3.4 and 3,

b) Through the use of suitable fuels and materials, higher stacks, reduction of the facilities, or

c) Through reduction of the emissions from other facilities operated by the applicant

to such an extent that maintenance of the emission values can be ensured.

In the case in Paragraph 1, Section c, the applicant may be permitted to reduce emissions from existent facilities within a stated period which, as a rule, shall not exceed six months following commissioning of the new facility, so as to avoid production losses or in other cases of hardship.

2.2.1.3. The approval of facilities in areas in which immission values are exceeded shall not be denied because of this excess if the applicant replaces an existent facility of the same type with the new facility and thereby considerably reduces emissions and immissions. In order to prevent production losses or in other cases of hardship, the applicant may be permitted to shut down the existent facility within a given period which shall, as a rule, not exceed six months after commissioning of the facility.

2.2.1.4. In areas in which immission values are exceeded or are expected to be exceeded, approval shall not be denied because of the existent or expected excess if the possibilities for immission reduction pursuant to 2.2.1.2 are exhausted and if it is ensured, through an air purity maintenance

plan pursuant to § 47, Par. 3, No. 3, of the Federal Immissions Control Act, that the additional immissions caused by existent facilities of other operators will be reduced to the extent that the immission values will be maintained in the future within the new facility's area of influence.

2.2.1.5. In areas designated by statutory orders of the Land governments pursuant to § 49, Par. 2, of the Federal Immissions Control Act and in areas in which a sustained, appreciable exceeding of immission values (2.4) is to be feared in low-exchange weather conditions, designated by the highest responsible Land authorities on the basis of evaluations by the German Weather Service, the applicant may be required to store low-sulfur fuels and materials to cover a week's requirements and to convert to these fuels and materials under such weather conditions, unless adequate waste-gas desulfuration facilities are installed. Storage shall not be required if low-sulfur fuels can be drawn from continuous production (e.g. in colliery power plants) or a supply of low-sulfur fuels and materials can be ensured in another manner.

If conversion to low-sulfur fuels and materials is not suitable or not adequate to prevent considerable exceeding of the immission values in the case described in Paragraph 1, Sent. 1, the applicant may be required to limit operation of the facility during low-exchange weather conditions; in particular, to delay discontinuous activities such as startup procedures, cleaning and maintenance operations which can result in excessive emissions.

2.2.1.6. In areas designated by statutory orders of the Land governments pursuant to § 49, Par. 2, of the Federal Immissions Control Act and in areas in which a sustained, appreciable exceeding of immission values (2.4) is to be feared in low-exchange weather conditions, designated by

the highest responsible Land authorities on the basis of evaluations by the German Weather Service and in which immission values (2.4) can be expected to be considerably exceeded even if measures are implemented pursuant to 2.2.1.5, measures may be imposed on the applicant which exceed 2.2.1.1, Sections a and c.

2.2.2. Examination of Applications for the Issuance of Partial Approval

Partial approval pursuant to § 8 of the Federal Immissions Control Act may be issued, in particular, if the construction and operation of extensive and new types of facilities are provided for, the planning and construction of which is undertaken in sections or stages. Section 2.2.1 shall be applied to the issuance of partial approval.

2.2.3. Examination of Applications for Approval of Appreciable Alteration of the Location, Nature or Operation of a Facility

2.2.3.1. A decision as to whether an alteration is appreciable in terms of the maintenance of air purity shall be based on the content of the most recent approval. As a rule, such alterations shall be considered appreciable which can result in a considerable deviation from the emission or immission conditions on which most recent approval was based.

2.2.3.2. If the alteration can result in a deterioration of emission or immission conditions, in particular if it is connected with a considerable expansion of production, provisions of Section 2.2.1 shall apply in a corresponding manner to examination of the applications; the same shall apply to the case of the alteration of the structures equivalent to a new facility. In other cases, approval shall not be denied for reasons of air purity maintenance.

2.2.3.3. If examination pursuant to 2.2.3.2 indicates that the immission values are exceeded, the remainder of the facility may also be included in the examination.

2.2.4. Examination of Applications for Issuance of a Preliminary Decision

Section 2.2.1 shall apply in a corresponding manner to the issuance of a preliminary decision pursuant to § 9 of the Federal Immissions Control Act. A legitimate interest in the issuance of a preliminary decision shall exist if, in particular, complex or new types of facilities are involved and the furnishing of documentation required for an evaluation of the overall project would cause an unreasonable delay in the approval process.

2.2.5. Supplementary Directives

2.2.5.1. Use shall be made of the authorization in § 17, Par. 1, Clause 1, of the Federal Immissions Control Act, as a rule, if the following values are found to be exceeded:

a) The grayness values established in 2.3.2 and 3 for stack plumes;

b) The optical densities established in 2.3.3.3 for waste gas from oil firing, or

c) two times the mass concentrations, mass flows and mass ratios of dust emissions established in 2.3.3.1 and 2.3.3.2, and 2 1/2 times those established in 3.

2.2.5.2. In particular, supplementary directives pursuant to § 17, Par. 1, Clause 2, of the Federal Immissions Control Act shall be considered to be required if, through the measurement of immissions or their calculation from emissions, the immission values (2.4) are found to be exceeded.

2.2.5.3. If the requirements for supplementary directives pursuant to § 17, Par. 1, of the Federal Immissions Control Act exist, those measures shall be striven for which are planned for new facilities; § 17, Par. 2, of the Federal Immissions Control Act shall be observed here.

2.3. Limiting Emissions

2.3.1. General

In particular, advanced measures for limiting emissions which have been tested successfully in operation shall be considered state-of-the-art. In substantiated cases, measures which have not been conclusively tested in operation for the particular application may also be considered to be state-of-the-art, e.g. if they have been tested to such an extent that the planned application is feasible without unreasonable risk. In particular, comparable methods, systems or modes of operation shall be used in determining the state of the art for the particular application; if such methods, systems or modes of operation do not exist, especially strict requirements shall be applied to a test of whether the practical suitability of the measure for limiting emissions appears to be ensured.

For certain types of facilities, the provisions of Section 3 contain requirements for limiting emissions which correspond to the state of the art. The provisions of Sections 2.3.2 through 2.3.5 shall not be applied if the provisions of Section 3 contain requirements which differ.

In testing pursuant to Paragraph 1, guidelines from the VDI [Association of German Engineers] handbook Maintenance of Air Purity and DIN standards shall be used, particularly for emission- or immission-reducing instructions and directives, if they have been published by the Federal Minister of the Interior upon consultation with the highest Land authorities responsible for the maintenance of air purity.

2.3.2. Dark Smoke

The grayness of stack plumes shall be lighter than No. 2 on Ringelmann's chart.

2.3.3. Dust Emissions

2.3.3.1. Limiting Dust Emissions in Waste Gas

The dust emissions contained in waste gas shall not -- notwithstanding requirements in 2.3.3.4 -- exceed mass concentrations obtained from the graph (Fig. 1), if 2.3.3.2 is not applied.

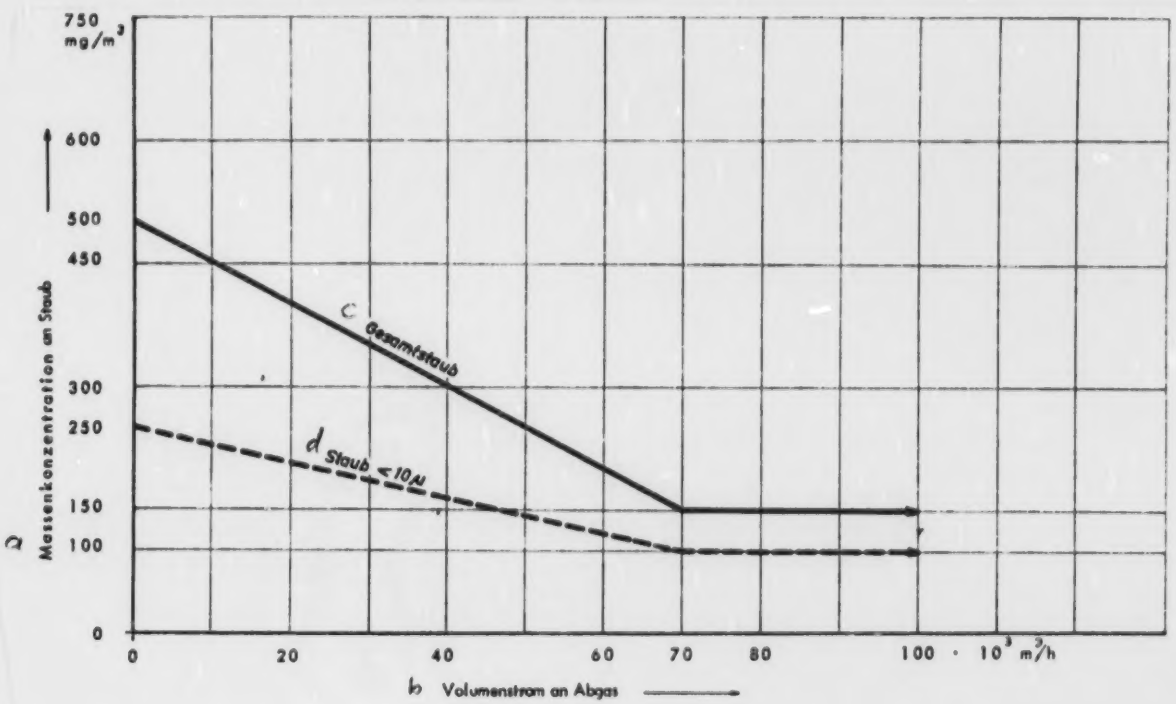

Fig. 1.

Key: a. Dust mass concentration
b. Waste gas volume flow
c. Total dust
d. Dust

2.3.3.2. Reducing Dust Emissions in Waste Gas from Certain Facilities

Dust emissions contained in the waste gas from conveying systems and comminution, sorting and filling facilities or similar facilities shall not exceed -- notwithstanding requirements in 2.3.3.4 -- a mass concentration of 150 mg/m^3 at a mass flow of up to 3 kg/h and a mass concentration of 75 mg/m^3 at a mass flow of more than 3 kg/h.

2.3.3.3. Limiting Dust and Soot Emissions in Waste Gases from Oil-Fired Systems

Dust and soot in the waste gases from oil-fired systems -- even if they are components of facilities -- shall not exceed density level 2 when heating oils EL [extralight] and L are used and density level 3 for heating oils M and S [heavy], measured in accordance with standard DIN 51402, September 1970. The waste gases must be free of oil and its decomposition products (pyridine test).

2.3.3.4. Limiting Emissions of Particular Dust Materials in Waste Gas

The materials in particular dust emissions in waste gas which are broken down into classes I through III in the list given below shall not exceed the following mass concentrations even if several materials in the same class are present:

Materials in class I at a mass flow of 0.1 kg/h or more,	20 mg/m^3
Materials in class II at a mass flow of 1 kg/h or more,	50 mg/m^3
Materials in class III at a mass flow of 3 kg/h or more	75 mg/m^3

In the presence of materials in several classes -- notwithstanding Clause 1 -- the mass concentration in waste gas shall not exceed a total of 50 mg/m^3 if materials in classes I and II occur together, and mass concentration in the waste gas shall not exceed a total of 75 mg/m^3 if materials in classes I and III and classes II and III occur together.

Material	Class
Aluminum carbide	III
Aluminum nitride	III
Ammonium compounds	III
Antimony and its soluble compounds[2]	II
Arsenic and its soluble compounds[2]	I
Asbestos	I
Barium sulfate	III
Barium compounds, if soluble[2]	II
Beryllium and its soluble compounds[2]	I
Bitumen	III
Boron trifluoride	II
Boron compounds, if soluble[2]	III
Lead and its soluble compounds[2]	I
Cadmium and its soluble compounds[2]	I
Calcium arsenate	I
Calcium cyanamide	III
Calcium fluoride	II
Calcium hydroxide	III
Calcium oxide	III
Chromium compounds, if hexavalent	I
Cristobalite with particles smaller than 5 µm	II
Fluorine compounds, if soluble[2]	I
Fluorspar	II
Iodine and its compounds	II
Diatomaceous earth	II
Cobalt and its compounds	II
Copper and its soluble compounds[2]	III
Copperas	I
Magnesium hydroxide	III
Magnesium oxide	III
Molybdenum and its soluble compounds[2]	III
Nickel	I
Nickel carbonate	I
Nickel oxide	I

[2]Soluble compounds are those materials which are soluble in the respiratory and digestive tracts, on the surface of the skin or in the absorbing organs of plants to such a degree that they can exercise their hazardous effects.

Material	Class
Nickel sulfide	I
Phosphates	III
Phosphorus pentoxide	I
Quartz with particles smaller than 5 μm	II
Mercury and its compounds, except cinnabar	I
Soot	II
Selenium and its soluble compounds[2]	I
Silver compounds, very soluble, e.g. silver nitrate[2]	II
Ferrosilicon	III
Silicon carbide	III
Strontium and its compounds	II
Tar	II
Cutback pitch	II
Tellurium and its soluble compounds[2]	I
Thallium and its compounds	I
Tridymite with particles smaller than 5 μm	II
Uranium and its compounds	I
Vanadium and its compunds	I
Bismuth	III
Tungsten and its compounds, except tungsten carbide	III
Zinc and its compounds	II
Dusts of organic compounds, e.g. anthracenes, aromatic amines, 1,4-benzoquinone, naphthalene	II

2.3.3.5. Reducing Dust Emissions in Treatment, Processing, Storage and Transport Activities

2.3.3.5.1. Producing, Conveying, Storing or Filling and Refilling Dusty Goods

In the conveying, comminution, sorting, filling or similar treatment of dusty materials, the dust-containing waste gases shall be collected and fed to dedusting systems.

Facilities for producing dusty goods with a maximum particle diameter of 5 mm shall be set up in enclosed areas if the escape of dust is not prevented by complete encapsulation or equivalent measures.

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[2]Soluble compounds are those materials which are soluble in the respiratory and digestive tracts, on the surface of the skin or in the absorbing organs of plants to such a degree that they can exercise their hazardous effects.

Dusty ground goods with a maximum diameter of 2 mm shall be transported in closed conveying facilities and stored in closed containers or areas if moistness corresponding to a mass content of at least 10% water is not continually maintained on the surface. Transfer systems and packaging systems for these ground goods shall be dust-tight.

2.3.3.5.2. Open Storage of Bulk Goods

When dusty bulk goods are stored in the open, measures shall be taken to prevent dust emissions, e.g.

by establishing overgrown earth embankments, windbreak plantings or windbreak hedges;

by encapsulating belt conveyors or other transport systems;

by continually adjusting discharge height at discharge and transfer points to the changing height of the pile;

by covering the surface, e.g. with mats or large-grained material (diameter >10 mm), by consolidation with binders or, in the case of moist bulk goods, by continual maintenance of a moisture level corresponding to a mass content of 10% water on the surface of the pile.

If the open storage of dusty bulk goods can result in emissions of materials listed in 2.3.3.4, Class I, open storage shall only be permitted if dust emissions are effectively prevented by coverage of the surface.

2.3.3.5.3. Transport and Storage of Dusty Combustion and Production Residues

Closed transport systems shall be used in the elimination of dusty combustion and production residues. If these residues are stored in the open, 2.3.3.5.2 shall apply correspondingly; surfaces of finished piles shall be planted immediately if possible.

2.3.3.5.4. Condition of Roadways

If it is to be expected that dust immissions will result from the use of roadways, the roadways shall be given a cover of bituminous roadbuilding materials, concrete or equivalent material in the vicinity of the facility and cleaned regularly or treated effectively with dust binders.

2.3.3.5.5. Emptying of Filter Systems

Dust emissions which might result from the emptying of filter systems shall be prevented by drawing the dusts off into closed containers or moistening them at the removal points.

2.3.4. Emissions of Gases and Vapors

2.3.4.1. Limiting Emissions of Inorganic, Gaseous Chlorine Compounds

If gaseous emissions of inorganic chlorine compounds amount to 3 kg/h or more, these compounds shall not exceed 30 mg/m^3 in the waste gas, expressed as Cl^-.

2.3.4.2. Limiting Emissions of Inorganic, Gaseous Fluorine Compounds

If gaseous emissions of inorganic fluorine compounds amount to 150 g/h or more, these compounds shall not exceed 5 mg/m^3 in the waste gas, expressed as F^-.

2.3.4.3. Limiting Emissions of Vaporous or Gaseous Organic Compounds in Waste Gas

Vaporous or gaseous emissions of organic compounds contained in waste gas, which are broken down into classes I through III in the list below, shall not exceed the following mass concentration, even if several organic compounds of the same class are present:

Organic compounds in class I at a mass flow of 0.1 kg/h or more, 20 mg/m^3

Organic compounds in class II at a mass flow of 3 kg/h or more, 150 mg/m^3

Organic compounds in class III at a mass flow of 6 kg/h or more. 300 mg/m^3

If organic compounds in several classes are present -- notwithstanding Clause 1 -- mass concentration in the waste gas shall not exceed a total of 300 mg/m^3.

Material	Chemical Formula	Class
Acetaldehyde	CH_3CHO	II
Acetone	CH_3COCH_3	III
Acrolein	CH_2CHCHO	I
Acrylonitrile	CH_2CHCN	I
Acrylic acids	$CH_2CHCOOH$	I
Ethylacrylate	$CH_2CHCO_2C_2H_5$	I
Methylacrylate	$CH_2CHCOCH_3$	I
Formic acid	$HCOOH$	I
Amyl acetate	$CH_3COOC_5H_{11}$	II
Aniline	$C_6H_5NH_2$	I
Ethanol	C_2H_5OH	III
Ethylbenzene	$C_6H_5C_2H_5$	II
Ethyl chloride	CH_3CH_2Cl	III
Ethylenediamine	$H_2NCH_2CH_2NH_2$	II
Ethylene glycol	$HOCH_2CH_2OH$	III
Ethyl glycol	$C_2H_5OCH_2CH_2OH$	III
Glycol monomethyl ether (methylglycol)	$CH_3OCH_2CH_2OH$	II
Ethylenimine	CH_2NHCH_2	I
Ethylene oxide	CH_2OCH_2	I
2-Ethyl-1-hexanol	$CH_3(CH_2)_3CH-(C_2H_5)CH_2OH$	II
Gasoline containing more than 25% C_7 and C_8 aromatics by weight:		II
Benzene and solvents containing more than 1% benzene by weight:	C_6H_6	I
Tetraethyl lead	$Pb(C_2H_5)_4$	I
1,3-Butadiene	$CH_2CHCHCH_2$	II
i-Butanol	$(CH_3)_2CHCH_2OH$	III
n-Butanol	C_4H_9OH	III
n-Butyl acetate	$CH_3COOC_4H_9$	III
Butyric acid	C_3H_7COOH	I
Caprioc acid	$CH_3(CH_2)_4COOH$	I
2-chloro-1,3-butadiene	$CH_2CClCHCH_2$	II
Chloracetic acid	$CH_2ClCOOH$	I
Chloropropionic acid	$CH_3CHClCOOH$	I
Cyclohexane	C_6H_{12}	III
Cyclohexanol	$C_6H_{11}OH$	III
Cyclohexanone	$C_6H_{10}O$	II
Diacetone alcohol	$(CH_3)_2C(OH)-CH_2COCH_3$	II
Diethanolamine	$(OHCH_2CH_2)NH$	II
Diethylamine	$(C_2H_5)_2NH$	I
Diethyl ether	$(C_2H_5)_2O$	III
Dibromoethane	$Cl\ BrCH_2Br$	II
1,1-dichloroethane (ethylene chloride)	$CHCl_2CH_3$	II
1,2-dichloroethane	$ClCH_2CH_2Cl$	I
1,2-dichloroethylene	$CHClCHCl$	III
p-Dichlorobenzene and o-dichlorobenzene	$C_6H_4Cl_2$	II
Dichloromethane	CH_2Cl_2	III
Dichlorophenol	$C_6H_3Cl_2OH$	I
Dimethylethyl-amine	$(CH_3)_2C_2H_5NH_2$	I
Dimethylamine	$(CH_3)_2NH$	I
Dimethyl aniline	$C_6H_5N(CH_3)_2$	I
Dimethylformamide	$HCON(CH_3)_2$	II
Dimethyl sulfide	CH_3SCH_3	I
Dimethyl sulfate	$(CH_3O)_2SO_2$	I
Dimethyl sulfoxide	$(CH_3)_2SO$	III
Dinitrobenzenes	$C_6H_4(NO_2)_2$	I
1,4-dioxane	$C_4H_8O_2$	II
Biphenyl	$(C_6H_5)_2$	I
Diisopropyl ether	$(CH_3)_2CHOCH-(CH_3)_2$	III
Epichlorohydrin	$CH_2(O)CHCH_2Cl$	I
Acetic acid	CH_3COOH	II
Ethyl acetate	$CH_3COOC_2H_5$	III
n-Amyl acetate	$CH_3COOC_5H_{11}$	II
n-Butyl acetate	$CH_3COOC_4H_9$	III

Material	Chemical Formula, Class	
Methyl acetate	CH_3COOCH_3	II
Vinyl acetate	$CH_3COOCHCH_2$	II
Formaldehyde	HCHO	I
Furfurol	$C_5H_4O_2$	I
n-Heptane	C_7H_{16}	III
Hexane 1,6-diisocyanate	$OCN(CH_2)_6NCO$	I
n-Hexane	C_6H_{14}	III
4-Hydroxy-4-methyl-2-pentanone	$(CH_3)_2C(OH)CH_2COCH_3$	III
Cresols	$C_6H_4(CH_3)OH$	I
Ketene	CH_2CO	I
Mercaptans		I
Methyl methacrylate	$CH_2C(CH_3)COOCH_3$	II
Methanol	CH_3OH	III
Methylamine	CH_3NH_2	I
Methyl ethyl ketone	$CH_3COC_2H_5$	III
Methyl butyl ketone	$CH_3CO(CH_2)_3CH_3$	III
Methylcyclohexane	$C_6H_{11}CH_3$	III
Methylcyclohexanone	$CH_3C_5H_9CO$	II
Methyl isobutyl ketone	$(CH_3)_2CHCH_2COCH_3$	III
Methyl isocyanate	CH_3NCO	I
Methylnaphthalene	$C_{10}H_7CH_3$	II
Monoethylamine	$C_2H_5NH_2$	I
Morpholine	$O(CH_2)_4NH$	II
Monoethanolamine	$H_2NCH_2CH_2OH$	II
Monochlorobenzene	C_6H_5Cl	II
Naphthalene	$C_{10}H_8$	II
Nitrobenzene	$C_6H_5NO_2$	I
Nitrocresol (2-nitro-p-cresol)	$CH_3C_6H_3OHNO_2$	I
Nitrophenols	$NO_2C_6H_4OH$	I
Nitrotoluenes	$NO_2C_6H_4CH_3$	II
n-Pentane	C_5H_{12}	III
1-Pentanol	$C_5H_{11}OH$	III
Phenol	C_6H_5OH	I
Phosgene	$COCl_2$	I
Pinene	$(CH_3)_2(Cl_2)_2C_5H_3$	III
Polychlorinated biphenyls (Clophen)		I
1-Propanol	$(CH_3)_2CHOH$	III
1-Propyl ether	$(CH_3)_2CHOCH(CH_3)_2$	III
Propylene oxide	CH_3CHCH_2O	II
Propionic acid	C_2H_5COOH	II
Pyridine	C_5H_5N	I
Carbon disulfide	CS_2	II
Styrene	$C_6H_5CHCH_2$	II
Tetrachloroethane	$C_2H_2Cl_4$	I
Tetrachloroethylene	Cl_2CCCl_2	III
Carbon tetrachloride	CCl_4	I
Tetrahydrofuran	C_4H_8O	II
Tetrahydronaphthalene	$C_{10}H_{12}$	II
Thioether	C_4H_8S	I
Thiocresol	$CH_3C_6H_4SH$	I
Thiophenol	C_6H_5SH	I
Toluene	$C_6H_5CH_3$	II
Tolylene diisocyanate	$CH_3C_6H_3(NCO)_2$	I
Triethylamine	$(CH_3OHCH_2)_3N$	II
Triethylene glycol	$(C_2H_5)_3N$	I
Trimethylamine	$HOC_2H_4OC_2H_4OC_2H_4OH$	III
1,1,1-Trichloroethane	$(CH_3)_3N$	I
1,1,2-trichloroethane	CH_3CCl_3	III
Trichloroethylene	$CH_2ClCHCl_2$	I
Trichloromethane (Chloroform)	CCl_2CHCl	II
Trichlorophenol	$CHCl_3$	II
Trioxane	$C_6H_2Cl_3OH$	I
Valeric acid	$(CH_2O)_3$	II
Vinyl chloride	$CH_3(CH_2)_3COOH$	I
Xylene	CH_2CHCl	II
	$C_6H_4(CH_3)_2$	II

The organic compounds not listed in the above classes I through III shall be assigned to those classes to whose compounds they are most similar in terms of their action in the vapor or gas phase; if it is not possible to assign them on the basis of action, organic compounds shall be assigned to those classes to whose compounds they are most similar in chemical nature

The most important areas of application of organic compounds and means for reducing emissions are presented in VDI Guideline VDI 2280 of April 1969.

2.4. Immission Values

2.4.1. General

Immission values shall be the values for long-term exposure (IW 1) and short-term exposure (IW 2) established in 2.4.2 and 2.4.3. With the exception of dusts with a particle size less than 10 μm and sulfur dioxide, whose simultaneous occurrence must be taken into consideration, the above shall refer to the lone action of the particular air pollutants.

Testing as to whether immission values are being satisfied shall be carried out in accordance with 2.5.

2.4.2. Immission Values for Dusts

2.4.2.1. Dust Precipitation

The following immission value is established for nonhazardous dust precipitation:

IW 1 0.35 g/(m^2d)

IW 2 0.65 g/(m^2d)

2.4.2.2. Dust Concentration in the Air

The following immission value is established for the mass concentration of nonhazardous dusts with a particle size of less than 10 μm in the air:

IW 1 0.10 mg/m^3

IW 2 0.20 mg/m^3

The following immission value shall apply when measurement methods are used with which dusts having a particle size greater than 10 μm are also included:

IW 1 0.20 mg/m^3

IW 2 0.40 mg/m^3

2.4.3. Immission Values for Gases

The following immission values are established for individual gaseous immissions in the air:

Type of Immission	Mass Concentration mg/m^3, IW 1	mg/m^3, IW 2
Chlorine	0.10	0.30
Hydrogen chloride -- given as inorganic gaseous chlorine compounds	0.10	0.20
Hydrogen fluoride -- given as inorganic gaseous fluorine compounds	0.0020	0.0040
Carbon monoxide	10.0	30.0
Sulfur dioxide	0.140	0.40
Hydrogen sulfide	0.0050	0.010
Nitrogen dioxide	0.10	0.30
Nitrogen monoxide	0.20	0.60

If no measurement method is available for measuring hydrogen chloride immissions with which measurements separate from chlorides can satisfactorily be made, the following immission value shall apply to hydrogen chloride in the air, given as inorganic gaseous chlorine compounds:

IW 1 0.10 mg/m^3

IW 2 0.30 mg/m^3

In areas in which it is determined, in accordance with 2.5.2, that the characteristic value I 1 does not exceed a mass concentration of 0.06 mg/m^3 air for sulfur dioxide, it shall be established that this value is satisfied when facilities are approved; the highest responsible Land authority may grant

variances in individual cases, provided the purpose of the Federal Immissions Control Act is not jeopardized for these areas.

2.5. Determination and Evaluation of Immissions

2.5.1. Basic Provisions

Measurements for determining immissions shall be carried out in such a manner that

a) The measured data can be compared with one another and

b) Characteristic quantities can be derived from the measured data which are suitable for an evaluation of the immissions by comparison with immission values (2.4).

These prerequisites are satisfied when the methods in 2.5.2 and 2.5.3 are applied. The execution of continuous measurements shall be striven for in all cases.

Prior to the beginning of measurement-taking, the number and the scope of immission measurements, measurement times and measurement locations shall be established in a measurement schedule, to be set up taking topography and the spatial and temporal distribution of immissions into consideration. Facts regarding emissions and meteorological dissemination conditions may be employed here.

The results of measurements of dust precipitation shall be reported as annual and monthly means; those of the mass concentration of dusts with a particle size below 10 µm, as daily means; and those of the mass or volume concentrations of gases, as half-hourly means. If the above-specified means are not suitable for determining or evaluating immissions in a given case, means taken over other time periods shall be reported.

2.5.2. Determination and Evaluation of Immissions in the Approval Process

2.5.2.1. General

If measurements are required to determine immissions, the measurement period shall amount to a maximum of one year. This may be shortened to two months if immissions can be evaluated in the shorter period. A shortening of the measurement period is to be considered, in particular, if the immissions that occur are subject to no seasonal fluctuations or if seasonal fluctuations can be covered by mathematical means.

The area in which the immissions are to be measured (measurement area) shall, as a rule, be square. The size of the measurement area shall be as follows:

Stack Height	Size of Area
up to 100 m	4 km x 4 km
up to 200 m	8 km x 8 km

If stack height H [m] is expected to be more than 200 m, the lateral length L [km] of the measurement area shall be calculated according to the following formula:

$$L = 8 + 0.08(H - 200)$$

The resultant lateral length L shall, as a rule, be rounded off to the nearest whole kilometer; when continuous measurements (2.5.2.4) are applied, to the nearest value in whole kilometers which is divisible by 4.

The measurement area shall be established in such a manner that the facility to be approved lies as close as possible to the center of the measurement area. Under special conditions (e.g. in valley locations), a rectangular measurement area whose greater lateral length is determined in accordance with Paragraph 2 may also be established; the ratio of sides shall be at least 1:4.

A determination of immissions by measurements based on an established measurement schedule may be dispensed with if immissions in the area of influence of the facility to be approved apparently do not amount to more than 50% of immission values (2.4), or emissions from the facility to be approved are low and it can be established on the basis of preliminary individual measurements or calculations that immission values (2.4) apparently will not be exceeded.

2.5.2.2. Dust Precipitation

2.5.2.2.1. Measurement Point Density and Measurement Frequency

A measurement point shall be established on every area of one square kilometer in the measurement area in order to determine immissions; the distance between adjacent measurement points shall be one kilometer. The location of measurement points may be established by the intersections of grid lines on plane-table sheets. If measurements cannot be made at the established measurement point or if, due to special local conditions, an adequate determination and evaluation of immissions is not feasible there, the measurements shall be made at the nearest accessible location. The deviation shall not exceed 200 meters.

The measurement equipment shall be set up for a time of (30 ± 2) days in each case.

2.5.2.2.2. Measurement Method

The determinations shall be made by the method described in VDI Guideline VDI 2119, Sheet 2, of June 1972 (Bergerhoff instrument).

2.5.2.2.3. Evaluation and Assessment

Dust precipitation shall be calculated by the following method for each measurement point:

$$\text{Dust precipitation} = m/(A \cdot t) \quad (g/m^2 d)$$

where m = mass of dust precipitation in g

A = collection area in m^2

t = sampling time in days

The characteristic quantities (2.5.1, Section b) for evaluating immissions for a measurement area shall be derived from dust precipitation by the following method:

Characteristic quantity I 1 for comparison with immission value IW 1 (2.4.2.1) shall be the arithmetic mean of dust precipitation at all measurement points within a measurement area.

The arithmetic mean of dust precipitation at all measurement points within a measurement area shall be calculated monthly to determine characteristic quantity I 2. Characteristic quantity I 2 for comparison with IW 2 (2.4.2.1) shall be the highest of the resultant arithmetic means.

In square measurement areas with a size of more than 4 km x 4 km or in rectangular measurement areas with a length of more than 4 km, the characteristic quantities for comparison with immission values shall be calculated for each area of 4 km x 4 km or of 4 km length, regardless of width, which is obtained upon parallel displacement to each side by 1 km in each case.

2.5.2.3. Mass Concentration of Dusts with a Particle Size of Less Than 10 µm and Mass or Volume Concentration of Gases (Sample Measurements)

2.5.2.3.1. Measurement Point Density and Measurement Frequency

Measurement points shall be established in accordance with 2.5.2.2.1,

Par. 1. Four measurement point networks with one measurement point each on an area of four square kilometers shall be superimposed in such a manner that a measurement point density of one measurement point per square kilometer results (Fig. 2).

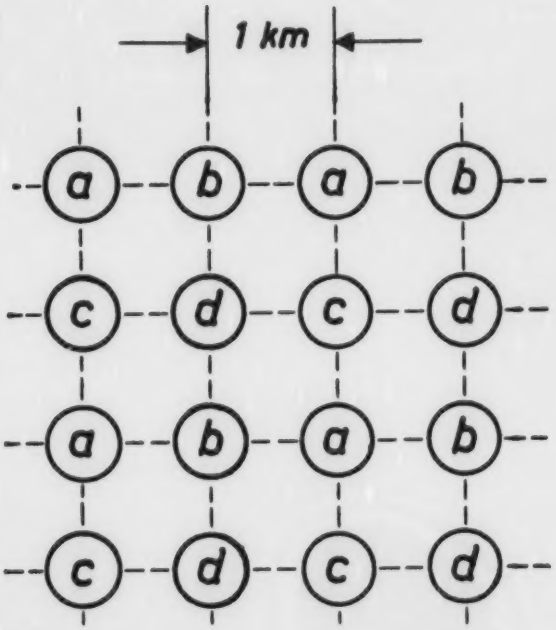

Fig. 2. Measurement point network.

All measurements within each measurement point network shall be made at least 13 times within the measurement period, even if the measurement period is shortened (2.5.2.1, Par. 1). Measurements shall be made, for example, on the first measurement day at points labeled a in Fig. 2, at points labeled b on the second, at points labeled c on the third, and at points labeled d on the fourth. Measurement shall be repeated after four weeks in each case or, if the measurement period is shortened or the

measurement area is reduced (2.5.2.1, Par. 2), at correspondingly shorter intervals at the same measurement point, so that the number of measurements as a whole is maintained.

Measurement days shall be established prior to beginning measurement, regardless of weather conditions.

2.5.2.3.2. Measurement Method

Determinations shall be made by the method described in the following VDI guidelines:

Type of Immission	VDI Guideline	Edition
Dust concentration	VDI 2463, Sheet 1	January 1974
Chlorine	VDI 2458, Sheet 1	December 1973
Carbon monoxide	VDI 2455, Sheet 1	August 1970
	VDI 2455, Sheet 2	October 1970
Sulfur dioxide	VDI 2451, Sheets 1 to 4	August 1968
Hydrogen sulfide	VDI 2454, Sheets 1 to 3	February 1974
Nitrogen monoxide and	VDI 2453, Sheet 1	November 1972
nitrogen dioxide	VDI 2453, Sheets 2 to 4	January 1974

2.5.2.3.3. Evaluation and Assessment

Characteristic quantities (2.5.1, Section b) for evaluating immissions shall be derived for a measurement area from all measured data by the following method:

Characteristic quantity I 1 for comparison with IW 1 (2.4.2.2 and 2.4.3) shall be the arithmetic mean of all individual values for a measurement area.

Characteristic quantity I 2 for comparison with IW 2 (2.4.2.2 and 2.4.3) shall be the 95% value for the cumulative frequency distribution of all individual values for a measurement area; this may also be calculated with the formula $I\ 2 = \overline{x} + t \cdot s$, where

$\bar{x}$ = arithmetic mean of individual values for a measurement area

s = [illegible]

x_i = individual values which are greater than $\bar{x}$

z = number of individual values which are greater than $\bar{x}$

t = critical point in Student's distribution; for one-sided testing, $t = 1.64$ for the 95% confidence region.

Section 2.5.2.2.3, Par. 5, shall apply accordingly.

2.5.2.4. Mass Concentration of Dusts with a Particle Size of Less Than 10 µm and Mass or Volume Concentration of Gases (Continuous Measurements)

2.5.2.4.1. Measurement Point Density and Measurement Frequency

Section 2.5.2.2.1, Par. 1, shall apply to the establishment of measurement points, with the provision that the distance between adjacent measurement points shall be four kilometers. Deviations shall not exceed 400 meters.

2.5.2.4.2. Measurement Method

Determinations shall be made by the measurement method described in 2.5.2.3.2.

2.5.2.4.3. Evaluation and Assessment

Characteristic quantities (2.5.1, Section b) for evaluating immissions shall be derived for a measurement area from all measured data by the following method:

Characteristic quantity I 1 for comparison with IW 1 (2.4.2.2 and 2.4.3) shall be the arithmetic mean of all individual values for a measurement area.

Characteristic quantity I 2 for comparison with IW 2 (2.4.2.2 and 2.4.3) shall be the 95% value of the cumulative frequency distribution of all individual values for a measurement area.

Section 2.5.2.2.3, Par. 5, shall apply accordingly.

As an example, the calculation of characteristic quantities is illustrated in Fig. 3 for an area of 4 km x 4 km for different measurement point configurations.

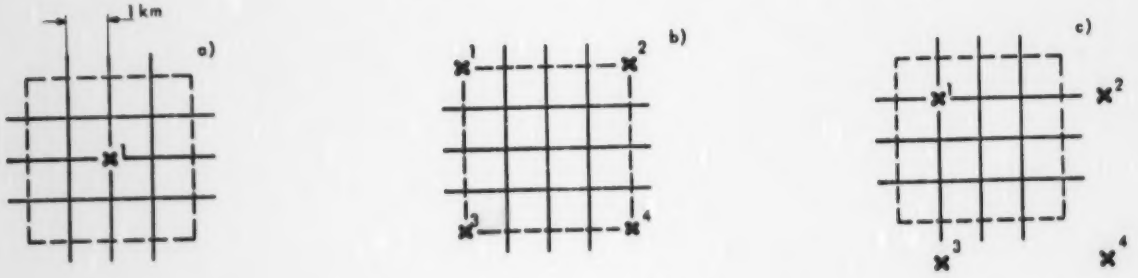

Fig. 3. x^1, x^2, x^3, x^4 are measurement points. In example a, only the results from measurement point x^1 are taken into consideration; in example b, results from measurement points x^1 through x^4, equivalently; and in example c, results from measurement points x^1 through x^4 proportionately (9/16 for measurement point x^1, 3/16 each for measurement points x^2 and x^3, and 1/16 for measurement point x^4).

2.5.3. Determination and Evaluation of Immissions for Testing in Accordance with 2.2.5

2.5.3.1. General

If measurements are necessary to determine whether prerequisites for supplementary directives (2.2.5) are satisfied in the area of influence of an existent facility, the measurement period and the measurement area in the area of influence shall be established in such a manner that an adequate evaluation is possible. The measurement area may be limited to subregions of the area of

influence in which effects have occurred or are to be expected; evaluation shall be limited to these subregions.

A determination of immissions using measurements based on an established measurement schedule may be dispensed with if it can be established on the basis of preliminary individual measurements or calculations that the immission values are exceeded by more than 50%.

2.5.3.2. Dust Precipitation

Dust precipitation shall be determined in compliance with the provisions (2.5.2.2) applying to the approval procedure. If the measurement points to be established on this basis for a determination of immissions in a subregion are not sufficient, additional measurement points shall be established, the distance between adjacent measurement points being no less than 250 m.

Sufficient protection from injurious environmental effects due to air pollutants shall not be considered to exist if the evaluation of measured data indicates that characteristic quantity I 1 exceeds IW 1 (2.4.2.1) or characteristic quantity I 2 exceeds IW 2 (2.4.2.1) at four adjacent measurement points which are to be considered jointly. In cases in which the testing of such a subregion is not sufficient for an evaluation as to whether injurious environmental effects due to air pollutants exist for the individual neighboring points, the measured data from a measurement point may be taken as a basis. If necessary, the immission source shall be determined, e.g. by analysis of the dust precipitation and a consideration of dispersion conditions.

2.5.3.3. Mass Concentration of Dusts with a Particle Size of Less Than 10 µm and Mass or Volume Concentration of Gases (Sample Measurements and Continuous Measurements)

The determination of immissions shall be carried out in compliance with the provisions applicable to the approval procedure; procedures in accordance with 2.5.2.3 shall be used for sample measurements and procedures in accordance with 2.5.2.4 shall be used for continuous measurements. If the measurement points to be established on this basis are not sufficient for a determination of immissions in a subregion, additional measurement points shall be established, the distance between adjacent measurement points being no less than 250 m.

Sufficient protection from injurious environmental effects due to air pollutants shall not be considered to exist if the evaluation of measured data from one measurement point in the case of continuous measurements or, in the case of sample measurements, for adjacent measurement points which are to be considered jointly indicates that characteristic quantity I 1 exceeds IW 1 (2.4.2.2 and 2.4.3) or characteristic quantity I 2 exceeds IW 2 (2.4.2.2 and 2.4.3).

If the originator of an immission whose permissiblity is to be checked is known, the measurements may be limited exclusively to the leeward area of influence of the facility. When this method is applied, however, only characteristic quantity I 2 may be determined.

2.6. Minimum Stack Height

2.6.1. General

Emissions shall as a rule be discharged via smokestacks. Height is to be established in such a manner that undisturbed removal of the emissions is made possible with free air currents and the observation of immission values

(2.4) is ensured. As a rule, these conditions are satisfied if

a) The stack projects 3 m above the ridge of the roof; as a rule, this is based on the height of a roof with a slope of 20°; and

b) Minimum stack height is determined on the basis of 2.6.2 and 2.6.3.

If minimum stack height is determined in accordance with Section a, it shall not exceed 2.5 times building height.

If minimum stack height is determined in accordance with section b, it shall not rise 250 m above immission level. If a greater minimum stack height is obtained, a reduction in emission shall be striven for.

2.6.2. Nomogram for Determining Minimum Stack Height

The nomogram (Fig. 4) assumes idealized dissemination conditions. The values to be taken from the nomogram therefore apply only if

a) The emissions are gaseous or if dusts are emitted which do not have an appreciable settling rate (particle size < 10 μm),

b) The emissions are subject to no physical or chemical change during dispersion,

c) The emissions are constant with regard to quantity and temperature,

d) Dispersion is disturbed neither by structures which exist or are permissible on the basis of a construction plan nor by vegetation,

e) The dispersion terrain is flat, and

f) The mean of existent immissions over time exhibits no appreciable differences in the horizontal direction.

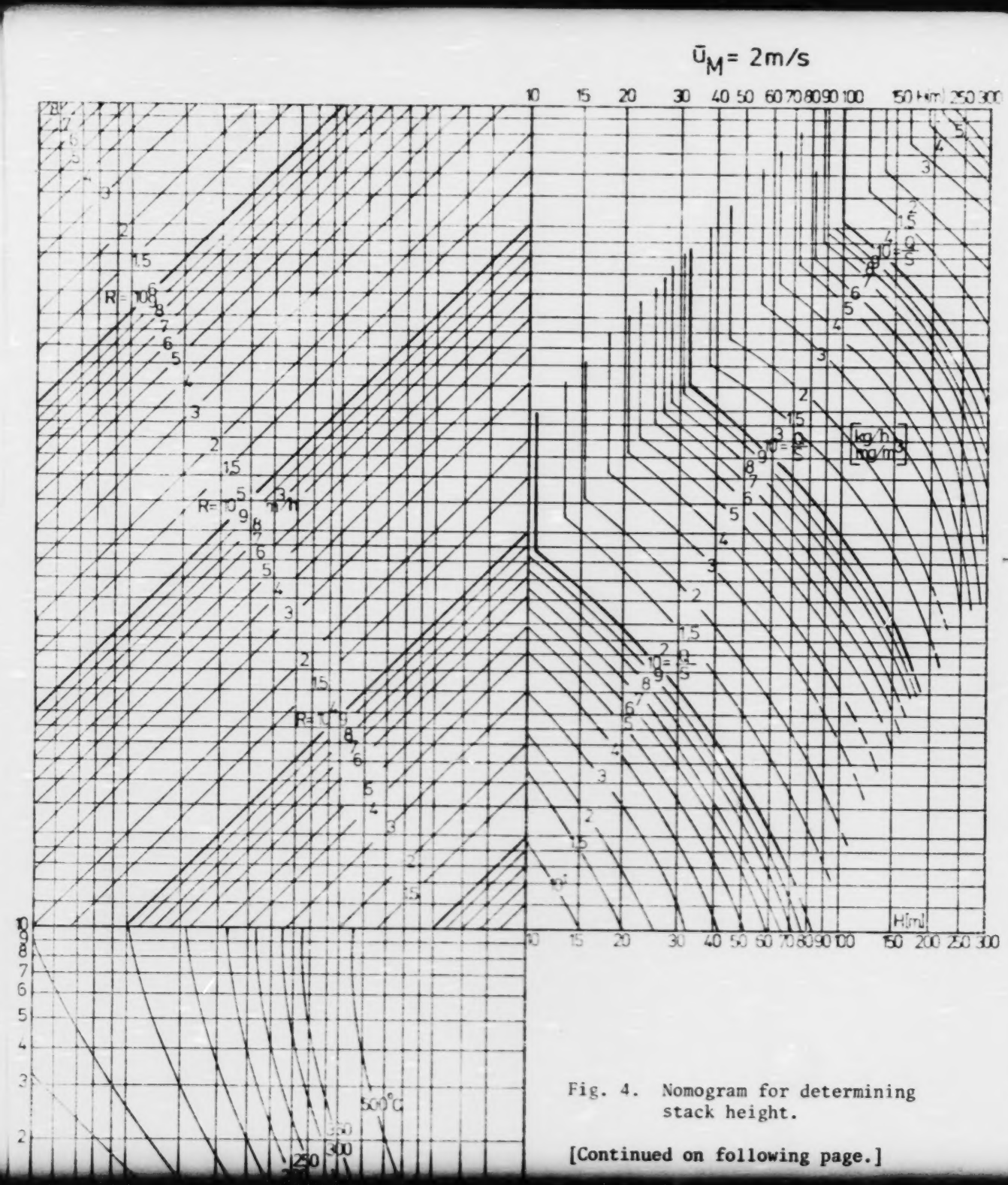

Fig. 4. Nomogram for determining stack height.

[Continued on following page.]

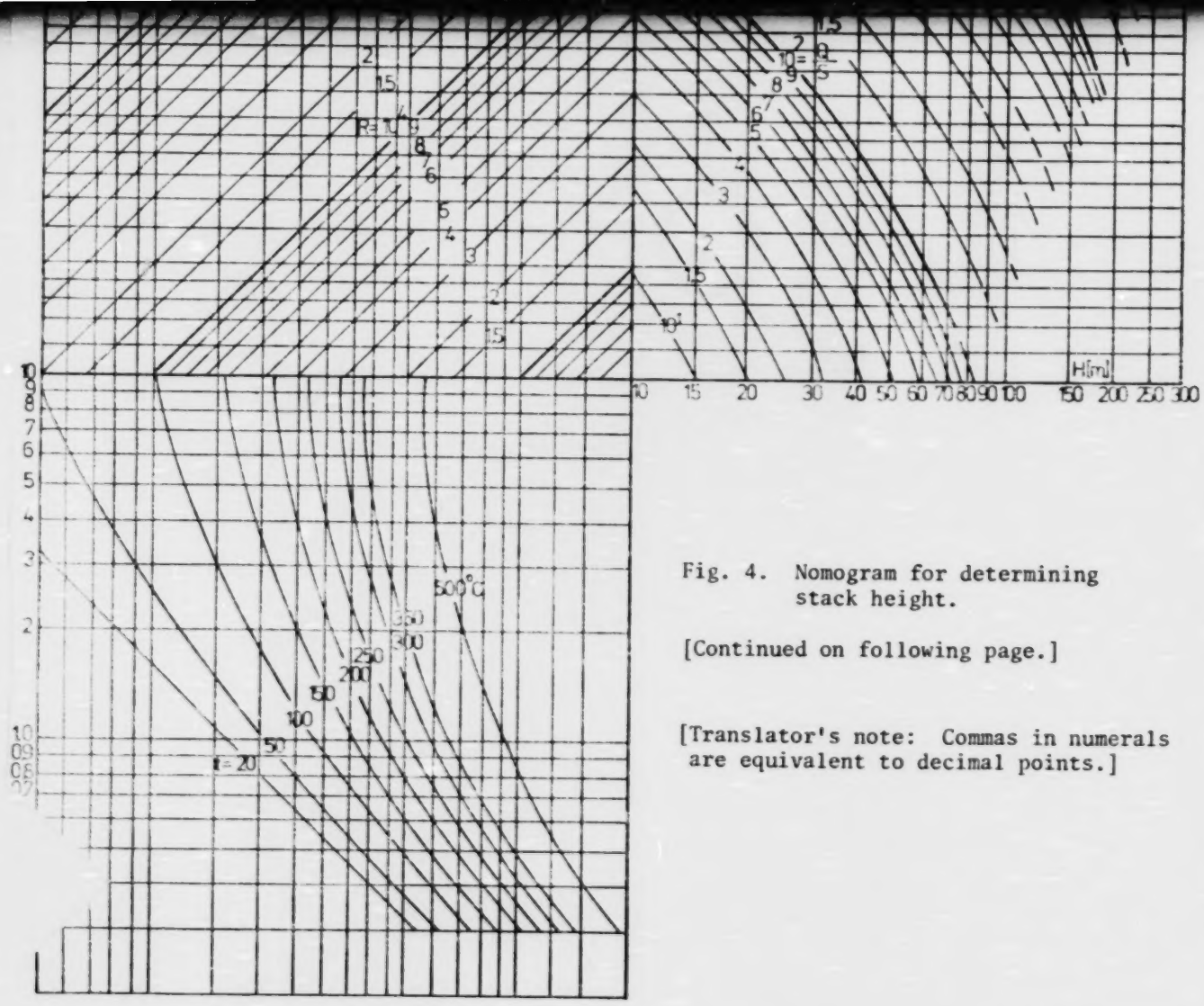

Fig. 4. Nomogram for determining stack height.

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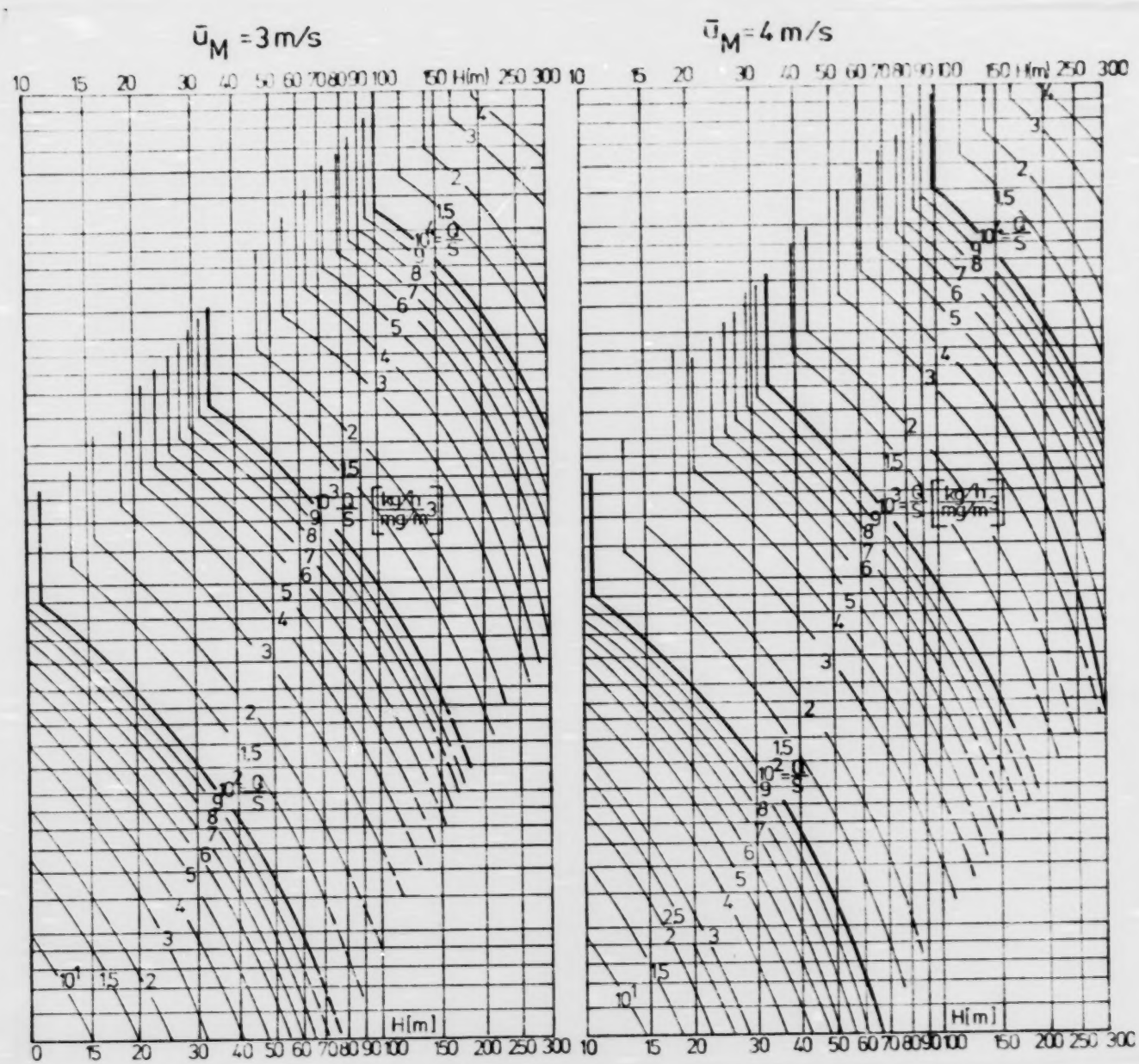
[Translator's note: Commas in numerals are equivalent to decimal points.]


$\bar{u}_M$ = 3 m/s
$\bar{u}_M$ = 4 m/s
H[m]
H[m]

If these conditions are not satisfied, the stack height determined with the nomogram requires a correction; if the condition in Section d is not satisfied, the correction shall be determined on the basis of 2.6.3.

Additional details can be taken from VDI Guideline VDI 2289 of July 1963.

The symbols have the following meanings:

H	[m]	Minimum stack height above immission level
d	[m]	Inside diameter of stack or inside diameter of calculated circular cross section
t	[°C]	Waste gas temperature at mouth of stack
R	[m^3/h]	Volume flow of waste gas in standard state
Q	[kg/h]	Mass flow of individual emitted pollutants
S	[mg/m^3]	The maximum value which can be used for S is 1/2·IW 2 (2.4). The highest responsible Land authority may prescribe values for S which deviate from this in certain areas, e.g. in high-load areas or in areas calling for particular protection.
$\bar{u}_M$	[m/s]	Mean wind velocity at a height of about 10 m at the location of the emitting facility.

In each case, the values for full operation and use of the fuels and/or raw materials least favorable for the maintenance of air purity that are to be employed in operation shall be used for the quantities t, R and Q.

2.6.3. Determination of Minimum Stack Height, Taking Buildings and Vegetation into Consideration

If the conditions in 2.6.2, Par. 1, Section d, are not satisfied and if compact structures already existent or permissible on the basis of a building plan or compact vegetation amounts to more than 5% of the area affected, stack height H determined from the nomogram (Fig. 4) shall be corrected with the formula $H' = H + J$. The value of J [m] shall be taken from Fig. 5.

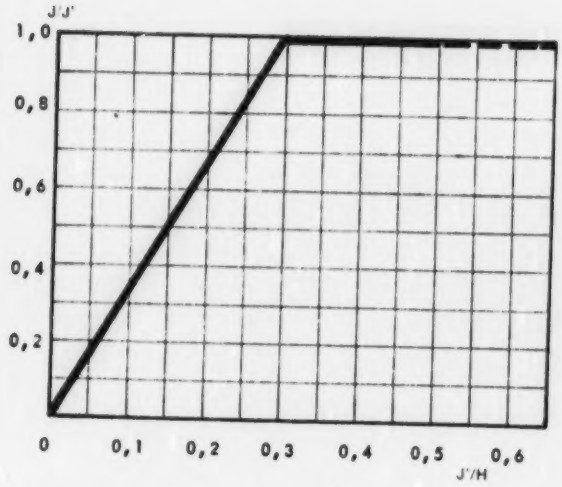


Fig. 5. Graph for determining the value of J, where J' = mean height of compact structures present or permissible on the basis of a building plan or of compact vegetation above the ground.

2.7. Dispersion Calculations

Whether the condition established in 2.2.1.1, Section b, is satisfied can be tested with the aid of dispersion calculations in the form of an immission prediction. A relationship which can be represented mathematically with certain simplifications exists between emission, stack height and immissions. Thus immissions in the facility's area of influence can be estimated for given emission and stack height.

As a rule, this method shall be applied for large-scale emitters.

2.8. Determination of Emissions

2.8.1. Measurement Stations

A requirement for the approval of facilities shall be that measurement points and measurement sections satisfy requirements of the VDI Guidelines specified in 3, particularly VDI Guideline VDI 2066 of May 1966. The measurement stations must ensure technically satisfactory and safe emission measurements.

A requirement shall be that the measurement stations are sufficiently large and easily accessible and that supply lines are laid.

2.8.2. Measurement Program

Measurements for determining emissions shall in all cases be carried out in such a manner that the measured data can be compared with one another. Measurement instruments and methods shall satisfy the requirements of the VDI Guidelines specified in 3, particularly of VDI Guideline VDI 2066 of May 1966. In the case of facilities with operating conditions which primarily remain constant with time, at least three measurements shall be made at the maximum power determined in the approval procedure and at least one additional measurement in each operating state which is important for the evaluation of emissions, e.g. cleaning or regeneration operations, during soot blowing, and during relatively long startup periods.

In facilities with operating conditions which primarily vary with time, measurements shall be made in sufficient number, but at least six under operating conditions with maximum emission.

The duration of individual measurements shall be made as short as possible; it shall not exceed 2 hours in those cases in which measurements must be made over the cross section of a flue gas, waste gas or waste air duct and measurement involves particular difficulty.

2.8.3. Evaluation and Assessment

The measurement report shall contain information on all individual data, on the measurement method used, and on the operating conditions which are important for the evaluation of individual data and measurement results. This also includes information on fuel, raw materials and operating materials, as well as on the operating state of the waste gas purification system.

No objection to the facility shall be made with regard to emissions if no individual value exceeds the established emission limit.

2.8.4. Continuous Monitoring of Emissions

2.8.4.1. General

The maintenance of emission limits may be monitored by the continuous or continuously recording measurement of emissions, particularly in order to establish the effectiveness of waste gas purification systems (dedusters, gas scrubbers, afterburning systems, etc.) and in order to determine emissions as a function of raw materials or methods.

2.8.4.2. Continuous Measurement of Dust Emissions

Every firing system for solid and liquid fuels with a maximum firing thermal power of 15 GJ/h or more[3] shall be equipped with a measuring instrument that continually records smoke density in order to monitor firing. Every firing system for solid fuels and for heating oil M or S with a maximum firing thermal power of 100 GJ/h or more[3] and systems with dust emissions (including combustibles of more than 15 kg/h shall be equipped with a measuring instrument which continuously records the concentration of dust emissions.

The Federal Minister of the Interior publishes suitable measurement instruments and guidelines for the calibration checking, maintenance, installation and calibration of measurement instruments and on the evaluation of measured data.

In the case of facilities with dust emissions of materials listed in Section 2.3.3.4, the mass of these materials emitted daily shall be determined if emission exceeds 2 kg/h for materials in class I and 5 kg/h for materials

[3] In the case of several firing systems, the sum of firing thermal powers per stack shall be used.

in class II.

If it is to be feared that the established emission limit will at times be exceeded at a facility, e.g. when the mode of operation of a facility is changed or when a waste gas cleaning system malfunctions, the continuous measurement of dust emissions may also be required for smaller firing thermal powers than those specified in Paragraph 1 and emission masses specified in Paragraph 3.

The measured data shall be kept on file for at least 5 years.

2.8.4.3. Continuous Measurement of Gaseous Emissions

Facilities with gaseous emissions higher than the following values in each case shall be equipped with a measurement instrument which continuously records the mass concentration of these materials in order to monitor the effectiveness of measures for emission reduction:

100 kg/h	Sulfur dioxide
1 kg/h	Chlorine
10 kg/h	Organic compounds -- given as carbon
20 kg/h	Nitrogen oxides -- given as NO
1 kg/h	Inorganic gaseous chlorine compounds -- given as Cl^-
1 kg/h	Hydrogen sulfide
2 kg/h	Inorganic gaseous fluorine compounds -- given as F^-
5 kg/h	Carbon monoxide

The Federal Minister of the Interior publishes suitable measurement instruments and guidelines for the calibration checking,maintenance, installation and calibration of measurement instruments and on the evaluation of measured data.

The measured data shall be kept on file for at least 5 years.

2.8.5. Acceptance Measurements

When facilities are approved, it shall be required that an office determined by the highest Land authority determine -- as a rule no earlier

than 3 and no later than 12 months after commissioning of a facility -- whether the established emission limits are being maintained. This requirement shall be dispensed with if emissions are determined in accordance with 2.8.4.

3. Requirements Placed on Certain Types of Facilities

The provisions of Section 3 contain special requirements for the limitation of emissions applicable to certain types of facilities. If general requirements for the limiting of emissions in 2.3.3.1 through 2.3.4 may have special significance for certain types of facilities, special reference is made to these. The provisions are arranged by the numbers used in the listing in § 1 of the Regulation on Facilities Requiring Approval pursuant to § 16 of the Industrial Code.

3.1. Facilities under No. 1:

3.1.1. Furnaces for Solid Fuels

3.1.1.1. The following special requirements shall be imposed:

a) Dust emissions in waste gas from furnaces shall not exceed the following emission limits, which differ from 2.3.3.1:

For large-water-tube boilers	300 mg/m^3
For water-tube boilers with a volume flow of up to 500,000 m^3/h waste gas	150 mg/m^3
For water-tube boilers with a volume flow of more than 500,000 m^3/h waste gas:	
-- when lignite is used	100 mg/m^3
-- when hard coal is used	150 mg/m^3;

the emission limits refer to

A volume content of 13% O_2 for firing with wood or wood waste,

A volume content of 7% O_2 for the grate firing of large-water-tube boilers and water-tube boilers for coal,

A volume content of 6% O_2 for firing of water-tube boilers for coal with dry slag-off,

A volume content of 5% O_2 for firing of water-tube boilers for coal with liquid slag-off;

b) In the case of furnaces for water-tube boilers with a volume flow of more than 500,000 m^3/h waste gas, electrostatic filters shall be designed in such a manner that the emission limits are not exceeded in case of the simultaneous failure of one field in each filter series;

c) The grayness of waste gas plumes from furnaces for coal, with the exception of furnaces for flat grate boilers with shovel stoking, shall be lighter than number 1 on Ringelmann's chart, deviating from 2.3.2;

d) The emission limits in Sections a and c shall also be maintained in the case of soot blowing;

e) Emissions of carbon dioxide in waste gas shall not exceed 250 mg/m^3; this limit shall in each case be referred to the O_2 contents, by volume, of the waste gas specified in Section a and to nominal operating load.

3.1.1.2. Nitrogen oxide emissions shall be reduced as much as possible by technical means, e.g. by reducing combustion temperature with the aid of waste-gas return or two-stage combustion.

3.1.1.3. Sections 2.3.4.1 and 2.3.4.2 shall not be applied.

3.1.1.4. Sulfur dioxide emissions in waste gas from furnaces for coal shall be limited as much as possible; in the case of furnaces with a firing thermal power of less than 4 TJ/h, particularly through the use of low-sulfur hard coal (mass content $\leq$ 1%); in the case of furnaces with a maximum firing thermal power of 4 TJ/h or more, also through desulfuration of the waste gases (waste gas desulfuration of more than 80% can be achieved); when the

waste gases are desulfured, the furnace may also be permitted to operate at its maximum firing thermal power for a specific transition period which, as a rule, shall not exceed more than 3 years, if the waste gas desulfuration system cannot be operated because of a malfunction.

3.1.1.5. In the case of furnaces which are operated as two-stage systems, 3.1.2 and 3.1.3 shall be observed.

3.1.1.6. Reference is made to 2.3.3.5.2 through 2.3.3.5.5.

3.1.1.7. The technology of furnaces for water-tube and large-water-tube boilers for solid fuels and the means of reducing dust discharge are presented in VDI Guidelines VDI 2091 of March 1970 and VDI 2300 of August 1970.

3.1.2. Furnaces for Liquid Fuels

3.1.2.1. The following special requirements shall be imposed:

a) Dust emissions in waste gas shall not exceed the emission limits indicated by the graph (Fig. 6) -- which deviates from 2.3.3.1 -- referred to a volume content of 3% O_2, after subtraction of the adsorbed sufuric acid;

b) The emission limits in Section a and Section 2.3.3.3 shall also be maintained during soot blowing;

c) Emissions of carbon monoxide in waste gas shall not exceed 175 mg/m^3, referred to a volume content of 3% O_2.

3.1.2.2. Nitrogen oxide emissions shall be reduced as much as possible by technical means, e.g. by reducing combustion temperature with the aid of waste-gas return or two-stage combustion.

3.1.2.3. Section 2.3.3.4 shall not be applied to facilities with a waste gas flow, by volume, of up to 100,000 m^3/h.

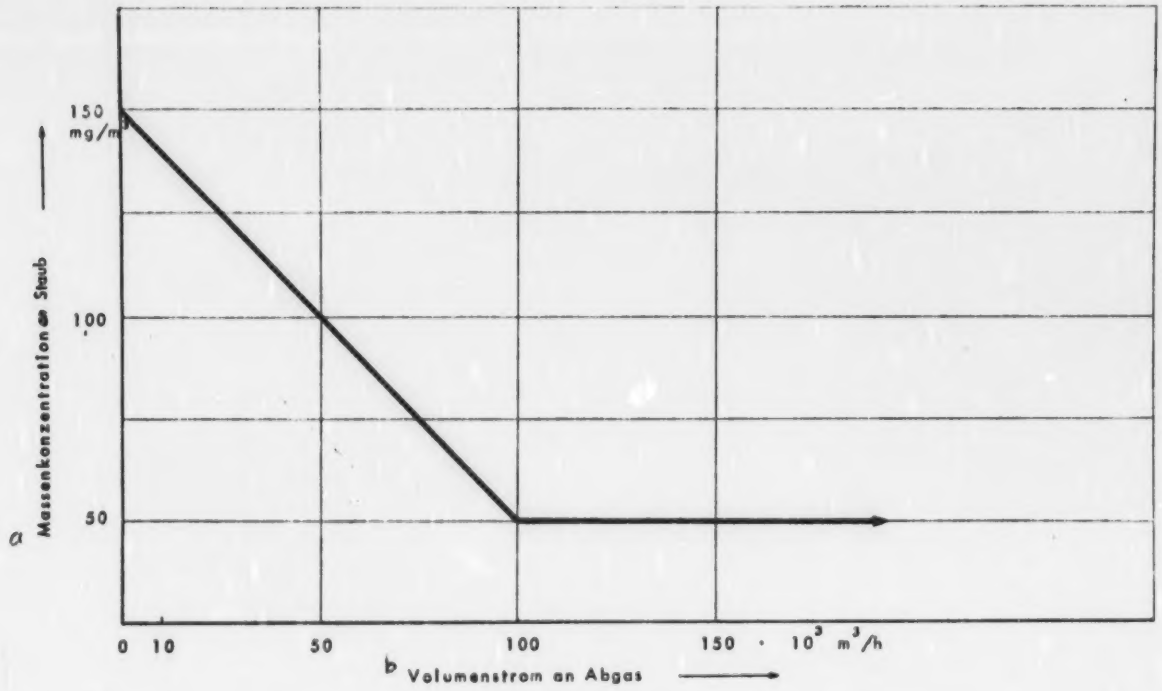


Fig. 6.

Key: a. Dust concentration by weight
b. Waste gas flow by volume

3.1.2.4. Sulfur dioxide emissions shall be limited as much as possible; in particular,

aa) In the case of facilities with a stack height of less than 30 m, through the use of heating oil with a maximum sulfur content of 0.5% by weight,

bb) In the case of facilities with a maximum firing thermal power of more than 40 GJ/h to 4 TJ/h, through the use of heating oil with a maximum sulfur content of 1% by weight; the use of heating oil with a higher sulfur content by weight may be permitted with the approval of the highest Land authority during times in which heating oil with a maximum sulfur content of 1% by weight can be shown to be unavailable, if the immission value for SO_2 is not thereby exceeded in the facility's area of influence;

cc) In the case of facilities with a maximum firing thermal power of more than 4 TJ/h, through the desulfuration of waste gases, through the continually ensured use of uniformly low-sulfur heating oils or through the use of methods with which the fuel is desulfured during or after carburetion of the oil (more than 80% desulfuration can be achieved for waste gases and after carburetion); if these methods are used for desulfuration, when the waste gases are desulfured, the furnace may also be permitted to operate at its maximum firing thermal power for a specific transition period which, as a rule, shall not exceed more than 3 years, if the waste gas desulfuration system cannot be operated because of a malfunction.

3.1.2.5. Sections 3.1.1 and 3.1.3 shall be observed for furnaces which are operated as two-stage systems.

3.1.2.6. The technology of boilers with oil firing and technical possibilities for reducing dust emissions are presented in VDI Guideline VDI 2297 of July 1969.

3.1.3. Furnaces for Gas Fuels

3.1.3.1. The following special requirements shall be imposed:

a) Gaseous emissions in waste gas shall not exceed the emission limits indicated by the following table (Fig. 7), referred to a content of 3% O_2 by volume:

	Sulfur Dioxide mg/m^3	Carbon Monoxide mg/m^3	Aldehydes -- Calculated as Formaldehyde mg/m^3
Natural gas	50	100	20
Coal gas	100	100	20

Fig. 7.

b) Dust emissions in the waste gas shall not exceed 50 mg/m^3 -- deviating from 2.3.3.1 -- when combustible gases from facilities for the production of pig iron and steel are used (3.4.1 and 3.6.1.2).

3.1.3.2. Nitrogen oxide emissions shall be reduced as much as possible by technical means, e.g. by reducing combustion temperature with the aid of waste-gas return or two-stage combustion.

3.1.3.3. Sections 3.1.1 and 3.1.2 shall be observed for furnaces which are operated as two-stage systems.

3.1.3.4. Reference is made to 2.3.3.4.

3.2. Facilities Under No. 2:

3.2.1.1. Facilities Which Are Designed Primarily to Entirely or Partially Eliminate Refuse from Households and Similar Materials by Combustion

3.2.1.1.1. The following special requirements shall be imposed:

a) Facilities for burning solid refuse consisting primarily of household garbage and similar odorous materials with a mass flow of more than 0.75 t/h shall have a garbage bin whose pressure shall be continually kept below atmospheric pressure; the air which is drawn off shall be fed to the furnace; if, in the case of continuously operated facilities, the furnace is not in operation, e.g. as the result of malfunctions, the drawn-off air shall be led off via the stack; in facilities which operate discontinuously (facilities which operate less than 24 hours daily or are shut down daily), the drawn-off air shall be led off via the afterburner chamber during the shutdown periods;

b) If liquid refuse is burned, in addition to solid materials, the liquid refuse shall be stored in closed containers; open transfer sites shall be equipped with a suction ventilator; the drawn-off air shall be fed to the furnace;

c) The facilities shall be equipped with an auxiliary furnace;

d) All facilities shall be connected to a stack;

e) The facilities must possess an afterburning chamber opening into the combustion chamber or located downstream from it, in which a minimum temperature of 800°C is maintained at a minimum O_2 content of 6% by volume in the waste gas and with a minimum dwell time of 0.3 sec; temperature shall be monitored with continuous recording; the facilities shall be laid out in such a manner that charging is only possible when this minimum temperature has been reached; an additional burner shall be installed in the afterburning chamber which is turned on automatically if temperature drops below the minimum and -- in facilities with a mass flow of more than 0.75 t/h, also if the facility is not in operation and the drawn-off air from the garbage bin is led off via the afterburning chamber;

f) The facilities shall be operated in such a manner that as complete combustion as possible of the waste gases and entrained fermentable components is ensured;

g) As an exception to 2.3.3.1, dust emissions in waste gas (f) shall not exceed 100 mg/m^3; the emission limit shall be referred to

-- a 17% O_2 content by volume for facilities with a refuse mass flow of up to 0.75 t/h,

-- an 11% O_2 content by volume for facilities with a refuse mass flow of more than 0.75 t/h;

h) As an exception to 2.3.2, the grayness of the waste gas plumes shall be lighter than number 1 on Ringelmann's chart;

i) The emission limits in Sections f and g shall also be maintained during soot blowing;

k) As an exception to 2.3.4.1 and 2.3.4.2, the gaseous emissions of the following inorganic compounds shall not exceed the specified values in systems with a refuse mass flow of up to 0.75 t/h:

Chlorine compounds -- given as Cl^-	6 kg/h
Fluorine compounds -- given as F^-	0.2 kg/h

l) As an exception to 2.3.4.1 and 2.3.4.2, the gaseous emissions of the following inorganic compounds in waste gas (f) shall not exceed the specified values in systems with a refuse mass flow of more than 0.75 t/h:

Chlorine compounds -- given as Cl^-	100 mg/m^3
Fluorine compounds -- given as F^-	5 mg/m^3;

the emission limits shall be referred to an O_2 content of 11% by volume;

m) Emissions of carbon monoxide in waste gas (f) shall not exceed 1 g/m^3; this emission limit shall in each case be referred to the O_2 content by volume specified in Section g;

n) As an exception to 2.8.4.2 and 2.8.4.3, facilities with a refuse mass flow of more than 0.75 t/h shall be equipped with measurement instruments which continuously record the mass concentration of dust emissions and gaseous emissions of inorganic chlorine and fluorine compounds.

3.2.1.1.2. Polychlorinated biphenyls (PCBs) or materials which contain PCBs shall be burned only in facilities particularly suited to this purpose; 3.2.1.2.1, Section d, Clause 5, shall be observed here.

3.2.1.1.3. In facilities with a refuse mass flow of up to 0.75 t/h which operate less than 24 hours daily or are shut down by the day and are located in the center of a city, time restrictions on operation may be necessary in view of low-exchange weather conditions (e.g. when radiation inversions occur frequently).

3.2.1.1.4. Reference is made to 2.3.3.4 and 2.3.3.5.3 through 2.3.3.5.5.

3.2.1.1.5. The technology of the facilities and means for combating dust emissions and for combating unpleasant odors are presented in VDI Guideline VDI 2114 of April 1969 and in VDI Guideline VDI 2301 of February 1967.

3.2.1.2. Facilities Which Are Designed to Entirely or Partially Eliminate Other Refuse by Burning

3.2.1.2.1. The following special requirements shall be imposed:

a) Liquid refuse shall be stored in closed containers; open transfer sites shall be equipped with a ventilating system; the drawn-off air shall be fed to the furnace; discharge is not permissible if the combustion system is out of operation;

b) The facilities shall be equipped with an auxiliary furnace;

c) All facilities shall be connected to a stack;

d) The facilities must possess an afterburning chamber opening into the combustion chamber or located downstream from it, in which a minimum temperature of 900°C is maintained at a minimum O_2 content of 6% by volume in the waste gas and with a minimum dwell time of 0.3 sec; temperature shall be monitored with continuous recording; the facilities shall be laid out in such a manner that charging is only possible when this minimum temperature has been reached; an additional burner shall be installed in the afterburning chamber which is turned on automatically if temperature drops below the minimum; as an exception to Clause 1, the minimum temperature shall be 1200°C if polychlorinated biphenyls (PCBs) or materials which contain PCBs are burned; an afterburning chamber shall not be required in facilities which operate by the fluidized bed method and if uniform total combustion is achieved;

e) As an exception to 2.3.4.3, emissions of carbon in combustible organic materials shall not exceed 50 mg/m^3 waste gas (f), referred to an O_2 content of 11% by volume;

f) As an exception to 2.3.3.1, dust emissions in waste gas (f) shall not exceed 100 mg/m^3, referred to an O_2 content of 11% by volume;

g) As an exception to 2.3.2, the grayness of the waste gas plumes shall be lighter than number 1 on Ringelmann's chart;

h) The emission limits in Sections f and g shall also be observed during soot blowing;

i) Emissions of carbon monoxide in waste gas (f) shall not exceed 100 mg/m^3, referred to an O_2 content of 11% by volume;

k) As an exception to 2.3.4.1 and 2.3.4.2, gaseous emissions of the following inorganic compounds shall not exceed the specified values:

Chlorine compounds -- given as Cl^- 100 mg/m^3 waste gas (f)

Fluorine compounds -- given as F^- 5 mg/m^3 waste gas (f);

the emission limits shall be referred to an O_2 content of 11% by volume;

l) As an exception to 2.8.4.2, the facilities shall be equipped with a measurement instrument which continuously records the mass concentration of dust emissions; as an exception to 2.8.4.3, facilities in which chlorinated compounds are burned shall be equipped with a measurement instrument which continuously records the mass concentration of inorganic gaseous chlorine compounds.

3.2.1.2.2. Reference is made to 2.3.3.3, 2.3.3.4 and 2.3.3.5.3 through 2.3.3.5.5.

3.2.2.1. Facilities Which Are Designed to Recover Individual Components from Solids by Combustion

3.2.2.1.1. The following special requirements shall be imposed:

a) The facilities shall be equipped with an auxiliary furnace;

b) All facilities shall be connected to a stack;

c) The facilities must possess an afterburning chamber opening into the combustion chamber or located downstream from it, in which a minimum temperature of 900°C is maintained at a minimum O_2 content of 6% by volume in the waste gas and with a minimum dwell time of 0.3 sec; temperature shall be monitored with continuous recording; the facilities shall be laid out in such a manner that charging is only possible when this minimum temperature has been reached; an additional burner shall be installed in the afterburning chamber which is turned on automatically if temperature drops below the minimum; as an exception to Clause 1, the minimum temperature shall be 1200°C if polychlorinated biphenyls (PCBs) or materials which contain PCBs are burned;

d) As an exception to 2.3.3.1, dust emissions in the waste gas shall not exceed 100 mg/m^3, referred to a CO_2 content of 7% by volume;

e) As an exception to 2.3.4.1, gaseous emissions of inorganic chlorine compounds, given as Cl^-, in the waste gas shall not exceed 100 mg/m^3, referred to a CO_2 content of 7% by volume;

f) The grayness of the waste gas plumes shall be lighter than number 1 on Ringelmann's scale;

g) As an exception to 2.8.4.2, the facilities shall be equipped with a measurement instrument which continuously records the mass concentration of dust emissions; facilities in which chlorinated compounds are burned shall be equipped with a measurement instrument which continuously records the mass concentration of inorganic gaseous chlorine compounds.

3.2.2.1.2. Reference is made to 2.3.3.3, 2.3.3.4, and 2.3.3.5.3 through 2.3.3.5.5.

3.2.3. Composting Facilities

3.2.3.1. The following special requirements shall be imposed:

a) For composting methods which operate with ventilation, the waste air shall be purified with an earth filter (compost filter) or the equivalent;

b) The vapors which condense out when the silos are ventilated and the waters which percolate through shall not be used to moisten the compost, but shall be fed to a clarification plant;

c) The feeder bins shall be closed and, if feasible, equipped with airlocks; air shall at least be drawn off when the room is opened and when garbage trucks are unloaded; this waste air shall be purified in an earth filter or the equivalent.

3.2.4. Facilities Which Are Designed to Prepare Materials Which Are to Be Burned, Composted or Aged (Refuse Preparation Facilities)

3.2.4.1. The following special requirement shall be imposed:

As an exception to 2.3.3.1, dust emissions in the waste gas shall not exceed 150 mg/m^3 waste gas.

3.2.4.2. Reference is made to 2.3.3.4, 2.3.3.5.4 and 2.3.3.5.5.

3.2.5. Facilities for Comminuting Scrap with Shredders

3.2.5.1. The following special requirement shall be imposed:

As an exception to 2.3.3.2, dust emissions in the waste gas shall not exceed 100 mg/m^3.

3.2.5.2. Reference is made to 2.3.3.4, 2.3.3.5.3, 2.3.3.5.4 and 2.3.3.5.5.

3.3. Facilities Under No. 3:

3.3.1. Facilities for Crushing and Classifying Rock Obtained in Quarries

3.3.1.1. Section 2.3.3.5.4 shall not be applied to roadways in a quarry which lead to the primary crusher.

3.3.1.2. Reference is made to 2.3.3.2, 2.3.3.4, 2.3.3.5.1 and 2.3.3.5.5.

3.3.1.3. The technology of the facilities and means of combating dust emissions are presented in the guideline published with the Federal Minister of the Interior circular of August 11, 1971 (Joint Ministerial Gazette 1971, p. 368).

3.3.2. Facilities for Grinding or Bloating Slate or Clay

3.3.2.1. The following special requirements shall be imposed:

a) As an exception to 2.3.3.1, dust emissions in the waste gas (f) from drying and bloating shall not exceed 150 mg/m^3, referred to a CO_2 content of 3% by volume;

b) In cases in which organic bloating aids are added, these shall not increase the carbon component in combustible organic materials in waste gas (f) by more than 20 mg/m^3; when organic bloating aids are employed, waste gases from the dryer shall be made use of whenever possible or fed to an after-burning system.

3.3.2.2. Section 2.3.3.5.4 shall not be applied to roadways in a quarry which lead to the primary crusher.

3.3.2.3. Reference is made to 2.3.3.2, 2.3.3.5.1, 2.3.3.5.3 and 2.3.3.5.5.

3.3.2.4. Considerable emissions of sulfur oxides, fluorine compounds and organic compounds can be produced during the bloating of clays.

3.3.3.1. Facilities for Grinding Bauxite, Dolomite, Feldspar, Gypsum, Diatomaceous Earth, Magnesite, Mineral Pigments, Shells, Pegmatite Sand, Quartzite, Fire Clay, Slag, Steatite, Talc, Tuff (Trass) and Limestone

3.3.3.1.1. Section 2.3.3.5.4 shall not be applied to roadways in a quarry which lead to the primary crusher.

3.3.3.1.2. Reference is made to 2.3.3.2, 2.3.3.4, 2.3.3.5.1, 2.3.3.5.2, 2.3.3.5.3 and 2.3.3.5.5.

3.3.3.2. Facilities for Burning Dolomite, Magnesite and Limestone

3.3.3.2.1. The following special requirement shall be imposed:

As an exception to 2.3.3.1, dust emissions in the waste gas from furnaces shall not exceed 150 mg/m^3.

3.3.3.2.2. Section 2.3.3.5.4 shall not be applied to roadways in a quarry which lead to the primary crusher.

3.3.3.2.3. Reference is made to 2.3.3.2, 2.3.3.4, 2.3.3.5.1, 2.3.3.5.2 and 2.3.3.5.5.

3.3.3.2.4. Continuously recording measurement of dust emissions in the waste gases from furnaces and grinding plants shall be provided for if feasible, case by case.

3.3.3.2.5. In addition to dust emissions, carbonization gases and CO can occur.

3.3.3.3. Facilities for Calcining Gypsum

3.3.3.3.1. The following special requirements shall be imposed:

As an exception to 2.3.3.1, dust emissions in waste gas (f) produced during calcining shall not exceed 150 mg/m^3; if filtering dedusters are employed dust emissions in waste gas (f) shall not exceed 75 mg/m^3.

3.3.3.3.2. Section 2.3.3.5.4 shall not be applied to roadways in a quarry which lead to the primary crusher.

3.3.3.3.3. Reference is made to 2.3.3.2, 2.3.3.5.1, 2.3.3.5.2 and 2.3.3.5.5.

3.3.4. Facilities for the Production of Cements

3.3.4.1. The following special requirements shall be imposed:

a) As an exception to 2.3.3.1 and 2.3.3.2, dust emissions in the waste gas shall not exceed the following values:

-- for facilities which are not equipped with electrostatic dedusters — 75 mg/m^3

-- for facilities which for technical reasons are generally equipped with electrostatic dedusters, such as cement furnaces, clinker coolers, dryers, hot-air drying systems, tube mills with moist waste air, if electrostatic dedusting is employed — 120 mg/m^3

-- for facilities in which removal is disproportionately difficult because of high electrical resistance in the dust, if electrostatic dedusting is employed — 150 mg/m^3

b) The clinker material shall be stored in enclosed areas; storage of excess winter production in the open shall be permissible if dust emissions are prevented during storage and loading by equivalent measures;

c) Cement furnaces shall be equipped with a measurement instrument which continuously records the concentration of dust emissions.

3.3.4.2. In the case of clinker coolers, the waste gas shall be utilized as completely as possible.

3.3.4.3. Section 2.3.3.5.4 shall not be applied to roadways in a quarry which lead to the primary crusher.

3.3.4.4. Reference is made to 2.3.3.4, 2.3.3.5.1, 2.3.3.5.2 and 2.3.3.5.5.

3.3.4.5. The continuously recording measurement of dust emission in the waste gases from raw mills, from clinker cooling and from cement grinding mills shall be provided if feasible, case by case.

3.3.4.6. High-sulfur fuels may be used if the sulfur contained in the fuel can be fixed during firing of the cement clinkers, during hot-air drying or in the evaporation cooler and the quality standards for the cements do not prevent this.

3.3.4.7. The technology of facilities and means for reducing dust emissions are presented in VDI Guideline VDI 2094 of February 1967.

3.3.5. Facilities for Firing Coarse Ceramic Products, Particularly of Refractory Bricks, Stoneware Pipes and Other Products of Coarse Stoneware, Wall and Floor Bricks, Roof Tiles, Clinkers, and Other Brickworks Products

3.3.5.1. The following special requirements shall be imposed:

a) As an exception to 2.3.4.2, gaseous emissions of inorganic fluorine compounds, given as F^-, shall not exceed 30 mg/m^3 in the waste gas, referred to a CO_2 content of 3% by volume; if damage is to be feared, e.g. if the firing plant is located in front of or on a sloped location, the gaseous emission of inorganic fluorine compounds, given as F^-, shall not exceed 5 mg/m^3 in the waste gas, referred to a CO_2 content of 3% by volume;

b) As an exception to 2.3.3.1, when alkaline earths are used to fix inorganic gaseous fluorine compounds, dust emissions shall not exceed 150 mg/m^3 in the waste gas, referred to a CO_2 content of 3% by volume.

3.3.5.2. Section 2.3.3.5.4 shall not be applied to roadways in a production facility which lead to the primary preparation system.

3.3.5.3. Reference is made to 2.3.3.3 and 2.3.3.4.

3.3.5.4. The technology of the facilities is presented in VDI Guideline VDI 2585 of March 1969.

3.4. Facilities Under No. 4:

3.4.1. Facilities for Producing Pig Iron

3.4.1.1. Blast Furnaces

3.4.1.1.1. The following special requirements shall be imposed:

As an exception to 2.3.3.1, dust emissions in the waste gas shall not exceed 20 mg/m^3 or, if the blast furnace gas is flared, 50 mg/m^3.

3.4.1.1.2. Reference is made to 2.3.3.4 and 2.3.3.5.

3.4.1.1.3. High-sulfur fuels may be employed if the sulfur contained in the fuel can be fixed in the slag and the requirements for pig iron quality do not prevent this.

3.4.1.1.4. The technology of the facilities and means of reducing dust emissions are presented in VDI Guideline VDI 2099 of February 1959.

3.4.2. Facilities for Producing Unrefined Nonferrous Metals

3.4.2.1. The following special requirements shall be imposed:

Waste gases with an SO_2 content of 2% by volume or more shall be fed to a utilizing system; SO_2 emissions after utilization shall not exceed the values obtained from the application of provisions in Section 3.17a. 3.1, Section b; in waste gases with an SO_2 content of less than 2% by volume, sulfur dioxide emissions shall be limited to 3 g/m^3 in the waste gas if feasible.

3.4.2.2. As an exception to 2.3.1 and 2.3.3.4, dust emissions in the waste gases from facilities for smelting lead shall not exceed 20 mg/m^3; otherwise, reference is made to 2.3.3.4.

3.4.2.3. The technology of the facilities and means for reducing dust and gaseous emissions are presented in the following VDI Guidelines:

VDI 2285	March 1974 Limitation of discharge Lead smelting works
VDI 2101	September 1966 Limitation of discharge Copper ore smelting works
VDI 2102	October 1966 Limitation of discharge Copper-scrap smelting works and copper refineries
VDI 2287	July 1963 Limitation of dust discharge Wet-metallurgy copper production by chloridizing roasting

3.5. Facilities Under No. 5:

3.5.1. Iron Ore Sintering Plants

3.5.1.1. Section 2.3.4.2 shall not be applied; if feasible, however, gaseous emissions of inorganic fluorine compounds, given as F^-, shall not exceed 5 mg/m^3 in the waste gas.

3.5.1.2. As an exception to 2.3.3.5.1, fines containing less than 10% water by weight at the surface may be stored in the open if, for reasons relating to production, a lower moisture content is necessary for further processing and emissions can be prevented during storage and loading; otherwise, reference is made to 2.3.3.5.2 through 2.3.3.5.5.

3.5.1.3. Reference is made to 2.3.3.1 and 2.3.3.4.

3.5.1.4. The technology of the facilities and means for reducing dust and sulfur dioxide emissions are presented in VDI Guideline VDI 2095 of February 1963.

3.5.2. Facilities for Sintering Crude Phosphate Concentrates

3.5.2.1. The following special requirements shall be imposed:

a) As an exception to 2.3.3.1, dust emissions shall not exceed 75 mg/m^3 in the waste gas;

b) As an exception to 2.3.4.2, gaseous emissions of inorganic fluorine compounds, given as F^-, shall not exceed 10 mg/m^3 in the waste gas.

3.5.2.2. Section 2.3.4.1 shall not be applied; if feasible, however, gaseous emissions of inorganic chlorine compounds shall be limited to the value specified in this provision.

3.5.2.3. Reference is made to 2.3.3.4.

3.6. Facilities Under No. 6:

3.6.1.1. Facilities for Melting Pig Iron (Cupola Plants)

3.6.1.1.1. The following special requirements shall be imposed:

a) The waste gases produced when cupola plants are started up shall be collected and fed into a dedusting system;

b) The waste gases produced during meltdown in cupola plants with a molten-iron mass flow of more than 14 t/h shall be collected and fed into a dedusting system; if feasible, this shall also apply to cupola plants with a molten-iron mass flow of up to 14 t/h; in cupola plants with a molten-iron mass flow of more than 20 t/h, the hot gases shall be collected as completely as feasible (e.g. double furnace gas seal);

c) As an exception to 2.3.3.1, dust emissions shall

aa) not exceed the mass ratios indicated by the graph (Fig. 8) in facilities with a molten-iron mass flow of up to 14 t/h;

bb) not exceed a mass ratio of 0.250 kg/t of produced iron in facilities with a molten-iron mass flow of more than 14 t/h;

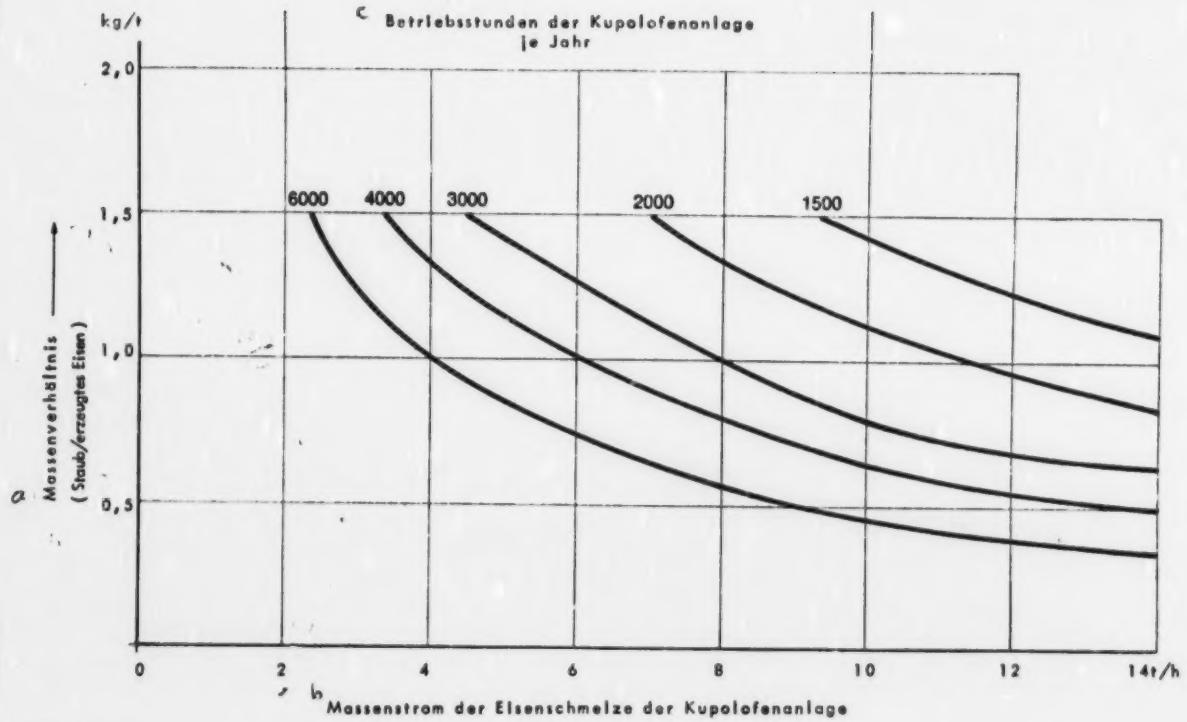


Fig. 8.

Key: a. Mass ratio (dust/produced iron)
b. Molten-iron mass flow in cupola plant
c. Cupola plant hours of operation per year

d) The CO contained in the furnace gas shall either be utilized, burnt or, if combustion with an efficiency of at least 90% is not feasible, dispersed in accordance with 2.6.

3.6.1.1.2. The technology of the facilities and means for limiting dust emissions are presented in VDI Guideline VDI 2288, Sheet 1, of September 1971.

3.6.1.2. Facilities for Producing Steel in Converters, Electric Arc Furnaces and Vacuum Melting Systems

3.6.1.2.1. The following special requirements shall be imposed:

a) During all operating procedures, e.g. during operations connected with filling and emptying processes and during mixing and desulfurizing processes, the waste gases shall be collected and fed to a dedusting system;

b) As an exception to Section 2.3.3.1, dust emissions shall not exceed 150 mg/m^3 in the waste gas;

c) Emissions of CO shall either be utilized, burnt, or if combustion with an efficiency of at least 90% is not feasible, dispersed in accordance with 2.6.

3.6.1.2.2. Reference is made to 2.3.3.4, 2.3.3.5 and 2.3.4.2.

3.6.1.2.3. The technology and means for reducing dust emissions for top blowing converters are presented in VDI Guideline VDI 2112, Sheet 1, of June 1966.

3.6.1.3. Electroslag Remelting Plants

3.6.1.3.1. The following special requirements shall be imposed:

a) As an exception to 2.3.4.2, gaseous emissions of inorganic fluorine compounds, given as F^-, shall not exceed 1 mg/m^3;

b) As an exception to 2.3.3.1, dust emissions shall not exceed 150 mg/m^3 in the waste gas when alkaline earths are used to fix hydrogen fluoride.

3.6.1.3.2. Reference is made to 2.3.3.4 and 2.3.3.5.4.

3.6.1.3.3. Hydrogen fluoride emissions can occur when the electroslag remelting process is used.

3.6.2. Facilities for the Machine Flame-Treatment of Steel

3.6.2.1. The following special requirement shall be imposed:

As an exception to 2.3.3.1, dust emissions shall not exceed 150 mg/m^3 in the waste gas.

3.6.2.2. Reference is made to 2.3.3.4, 2.3.3.5.3 and 2.3.3.5.5.

3.6.3.1. Facilities for Melting Aluminum

3.6.3.1.1. The following special requirements shall be imposed:

a) As an exception to 2.3.2, the grayness of all waste gas plumes shall be lighter than number 1 on Ringelmann's chart;

b) As an exception to 2.3.3.1, dust emissions shall not exceed 75 mg/m^3 in the waste gas, measured by the dry measurement method;

c) As an exception to 2.3.4.1, emissions of Cl_2 shall not exceed 3 mg/m^3 in the waste gases from refining (chloridization systems); 2.3.4.1 shall apply to inorganic gaseous chlorine compounds.

3.6.3.1.2. Sections 2.3.4.1 and 2.3.4.2 shall not be applied to melting plants; gaseous emissions of inorganic chlorine and fluorine compounds shall be reduced as much as feasible, however.

3.6.3.1.3. Reference is made to 2.3.3.4, 2.3.3.5.3 and 2.3.3.5.5.

3.6.3.1.4. Emissions of salt aerosols, chlorine, hydrogen chloride, hydrogen fluoride, soot and hydrocarbons can result from the processing of oil-bearing aluminum scrap, particularly oiled turnings, from paint and plastic materials in the scrap, from the use of salts as slag-forming fluxes and from the use of chlorine for refining.

3.6.3.2. Facilities for Melting Nonferrous Metals and Their Alloys, Other Than Aluminum (cf. 3.6.3.1)

3.6.3.2.1. The following special requirements shall be imposed:

a) As an exception to 2.3.2, the grayness of all waste gas plumes shall be lighter than number 1 on Ringelmann's chart;

b) As an exception to 2.3.3.1, dust emissions shall not exceed 75 mg/m^3 in the waste gas, measured by the dry measurement method;

c) As an exception to 2.3.4.1, emissions of Cl_2 shall not exceed 3 mg/m^3 in the waste gases from refining (chloridization systems); 2.3.4.1 shall apply to inorganic gaseous chlorine compounds.

3.6.3.2.2. Sections 2.3.4.1 and 2.3.4.2 shall not be applied to melting plants; gaseous emissions of inorganic chlorine and fluorine compounds shall be reduced as much as feasible, however.

3.6.3.2.3. Reference is made to 2.3.3.4, 2.3.3.5.3 and 2.3.3.5.5.

3.6.3.2.4. Emissions of salt aerosols, hydrogen chloride, hydrogen fluoride, soot and hydrocarbons can result from the processing of oil-bearing scrap, particularly oiled turnings, from paint and plastic materials and from the use of salts as slag-forming fluxes.

3.7. Facilities Under No. 7:

3.7.1. Iron, Malleable-Iron and Steel Foundries and Foundries for Nonferrous Metals

3.7.1.1. The following special requirements shall be imposed:

a) Dust-bearing waste gases shall be collected and fed to dedusting systems;

b) As an exception to 2.3.3.2, dust emissions shall not exceed 100 mg/m^3 in the waste gas;

c) The emissions produced during the casting of magnesium and its alloys involving the use of flowers of sulfur shall be eliminated in accordance with 2.6.

3.7.1.2. Section 2.3.4.3 shall not be applied; however, the organic compounds produced during coremaking and during casting and cooling shall be collected and subjected to aftertreatment where feasible.

3.7.1.3. Reference is made to 2.3.3.1, 2.3.3.4, 2.3.3.5.3 and 2.3.3.5.5.

3.17a. Facilities Under No. 17, Section a:

3.17a.1.1. Facilities for the Production of Hydrogen Chloride and Hydrochloric Acid

3.17a.1.1.1. The following special requirement shall be imposed:

As an exception to 2.3.4.1, in the production of HCl from H_2 and Cl_2, emissions of HCl shall not exceed 10 mg/m^3 in the waste gas.

3.17a.1.2. Facilities for the Production of Nitric Acid

3.17a.1.2.1. The following special requirements shall be imposed:

a) Emissions of NO_x, given as NO, shall not exceed the mass concentrations indicated by Curve 1 in the graph (Fig. 9); as an exception to this, emissions of NO_x, given as NO, shall not exceed the mass concentrations indicated by Curve 2 in the graph (Fig. 9) for elevated cooling water temperatures due to weather conditions during a maximum of 5% of the annual operating time;

b) As an exception to Section a, emissions of NO_x, given as NO, shall not exceed the mass concentrations indicated by the graph (Fig. 10) in facilities for the production of highly concentrated sulfuric acid ("hico" plants);

c) Waste gases from the facilities listed in Sections a and b shall be dispersed only in colorless form in accordance with 2.6; if feasible, any necessary decolorizing shall be done with the aid of final alkaline absorption if the utilization or safe elimination of resultant nitrite is ensured, or with the aid of catalytic reduction if a decrease in NO_x emission to 200 mg/m^3 is feasible with simultaneous limitation of the emission of total carbon in combustible organic materials in the waste gas; as a rule,

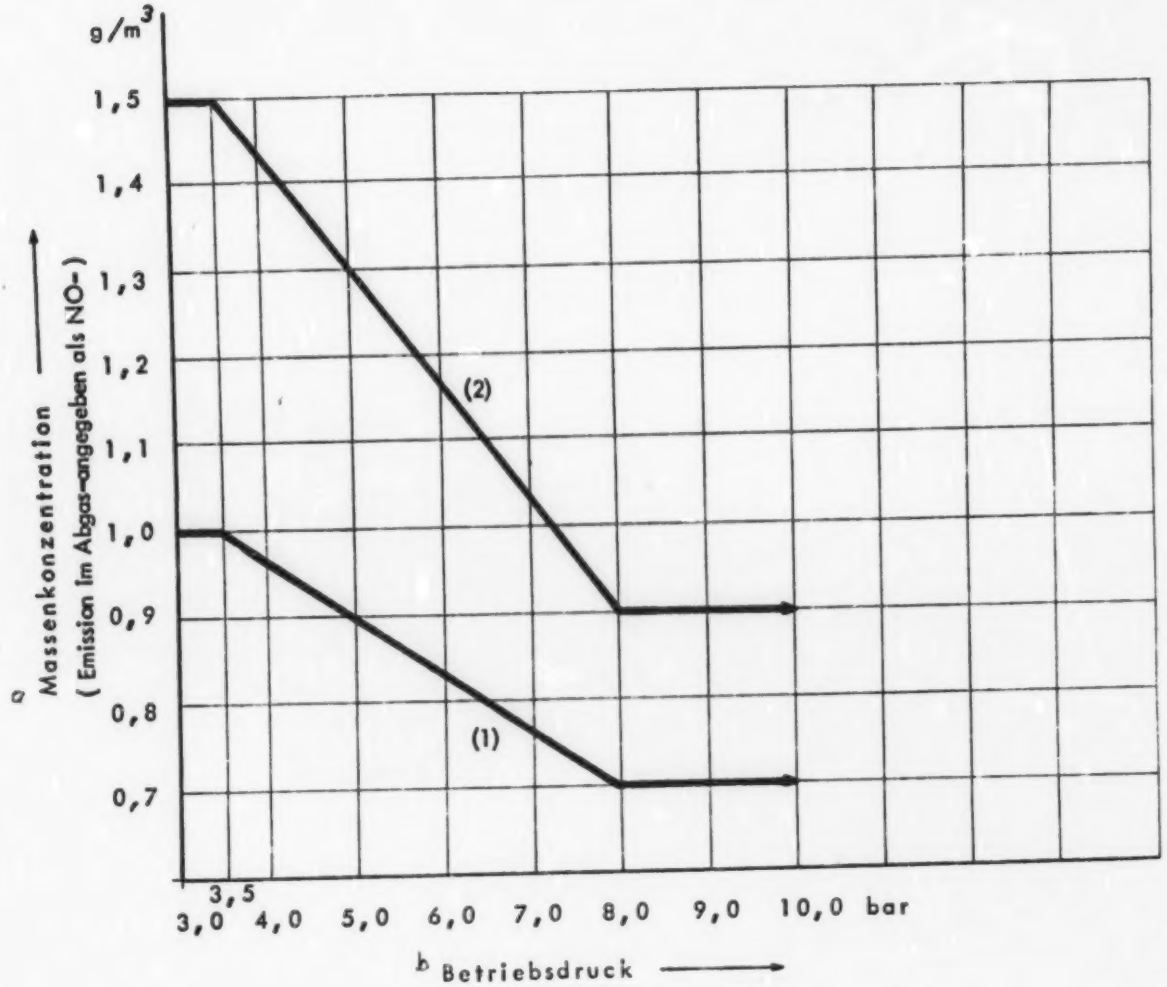


Fig. 9.

Key: a. Mass concentration (emission in waste gas, given as NO)
b. Operating pressure

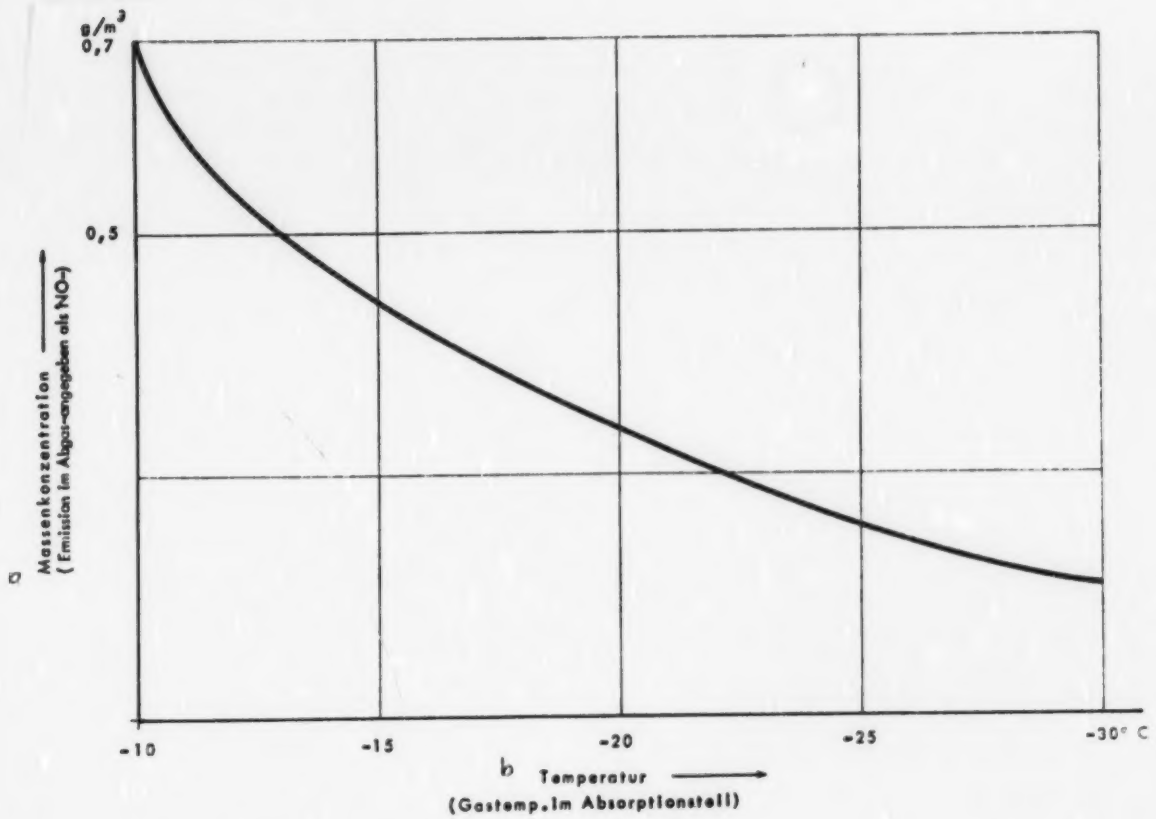


Fig. 10.

Key: a. Mass concentration (emission in waste gas, given as NO)
b. Temperature (gas temperature in absorption section)

the waste gases may be considered decolored if the concentration of NO_2, by weight, in the waste gas does not exceed the value indicated by the following formula, taking the maximum width of the stack into consideration in each case:

$$6100 \cdot 2.05/d = mg/m^3,$$

where d is the upper maximum inside dimension of the stack in cm;

e) The facilities shall be equipped with a continuously recording measurement device.

3.17a.1.3. Facilities for the Production of Sulfur Dioxide, Sulfur Trioxide and Sulfuric Acid

3.17a.1.3.1. The following special requirements shall be imposed:

a) In facilities for the production of 100% sulfur dioxide by absorption or by liquefaction, the gaseous end product shall be fed to an alkaline scrubber or a sulfuric acid plant: emissions of SO_2 in the waste gas shall not exceed 30 mg/m^3 if an alkaline scrubber is used and shall not exceed the values indicated in Section b in the case of sulfuric acid production;

b) In facilities for the production of sulfur dioxide and sulfuric acid with an SO_2 content of 8% or more by volume in the input gas, a conversion efficiency of at least 99.5% shall be maintained, a conversion efficiency of at least 99% during operating malfunctions and a conversion efficiency of 99% in facilities with an SO_2 content of 6 to 8% by volume in the input gas; emissions of SO_3 shall not exceed 0.4 kg/t H_2SO_4 here;

[c)] In facilities for the production of sulfur trioxide and sulfuric acid with an SO_2 content of less than 6% by volume in the input gas or in wet-catalysis systems with an output of less than 100 t/day, a conversion efficiency of at least 97.5% shall be maintained; emissions of SO_3 shall not exceed 0.6 kg/t H_2SO_4 here.

3.17a.1.3.2. Wherever possible, emissions in aerosol form shall be reduced by the use of aerosol precipitators.

3.17a.1.3.3. Reference is made to 2.3.3.4 and 2.3.3.5.

3.17a.1.3.4. The technology of the facilities and means for reducing sulfur dioxide emissions are presented in VDI Guideline VDI 2298 of August 1970.

3.17b. Facilities Under No. 17, Section b:

3.17b.1. Facilities for the Production of Aluminum

3.17b.1.1. The following special requirements shall be imposed:

a) As an exception to 2.3.3.1, in facilities for the production of aluminum oxide, dust emissions shall not exceed 150 mg/m^3 in the waste gas from calcining furnaces;

b) As an exception to 2.3.4.2, in facilities for the production of aluminum, gaseous emissions of inorganic fluorine compounds, given as F^-, shall not exceed the following values:

Enclosed furnaces (furnace gas collection and purification) 1 kg/t Al

Open furnaces (workshop air purification) 0.8 kg/t Al;

the concentration of hydrogen fluoride by weight, given as F^-, in the waste gas, discharged via a stack (2.6) after scrubbing, shall not exceed 2 mg/m^3;

c) As an exception to 2.3.3.1, in facilities for the production of aluminum, dust emissions shall not exceed 20 kg/t Al, measured with a membrane filter with a pore size of 3 μm;

d) When furnace gas collection is employed, a sufficient underpressure in the hood shall be employed during operation of the furnaces, even with the furnace casing open.

3.17b.1.2. Reference is made to 2.3.3.1, 2.3.3.3 and 2.3.3.5.

3.17b.1.3. If, in the case of enclosed furnaces, the dry precipitation of gaseous fluorine compounds is employed and followed by dedusting with filters, emissions may drop below the limits established in the form of a mass ratio in 3.17b.1.1, Sections b and c.

3.17b.1.4. The technology of aluminum oxide plants and aluminum refineries and means for reducing dust emissions and emissions of fluorine compounds are

presented in VDI Guideline VDI 2286 of March 1974.

3.17c. Facilities Under No. 17, Section c:

3.17c.1. Facilities for the Production of Corundum

3.17c.1.1. The following special requirements shall be imposed:

As an exception to 2.3.3.1, dust emissions in the waste gas shall not exceed the following emission limits:

Calcining furnaces	150 mg/m^3
Furnaces	150 mg/m^3

3.17c.1.2. Reference is made to 2.3.3.2, 2.3.3.4, 2.3.3.5.1, 2.3.3.5.4 and 2.3.3.5.5.

3.17c.1.3. The technology of the facilities and means for reducing emissions are presented in VDI Guideline VDI 2575 of July 1967.

3.17c.2. Facilities for the Production of Calcium Carbide

3.17c.2.1. The following special requirements shall be imposed:

a) As an exception to 2.3.3.1, dust emissions shall not exceed 150 mg/m^3 in the waste gas from the furnaces;

b) The CO contained in the waste gases shall be utilized or burned.

3.17c.2.2. Reference is made to 2.3.3.2, 2.3.3.5.1, 2.3.3.5.4 and 2.3.3.5.5.

3.17c.2.3. The technology of the facilities and means for reducing emissions are presented in VDI Guideline VDI 2111 of December 1965.

3.17d. Facilities Under No. 17, Section d:

3.17d.1.1. Facilities for Production of Chlorine

3.17d.1.1.1. The following special requirements shall be imposed:

a) Emissions of Cl_2 in the waste gas shall not exceed 3 mg/m^3, or 6 mg/m^3 for short periods during interruptions; as an exception to this, in facilities for the production of chlorine with complete liquefaction, emissions of Cl_2 shall not exceed 6 mg/m^3 in the waste gas;

b) If the mercury-cell method is used, the emission of mercury shall not exceed 3 g/t chlorine in the production-room waste air.

3.17d.1.1.2. The technology of the facilities and means for combating chlorine emissions are presented in VDI Guideline VDI 2103 of January 1961.

3.17d.1.2. Facilities for the Production of Fluorides

3.17d.1.2.1. The following special requirement shall be imposed:

As an exception to 2.3.4.2, in those cases in which the mass flow of hydrogen fluoride is 150 g/h or more, the emission of hydrogen fluoride in waste gas shall not exceed the emission limits indicated by the graph (Fig. 11).

3.17d.1.2.2. Reference is made to 2.3.3.1, 2.3.3.4, 2.3.3.5.3 and 2.3.3.5.5.

3.17d.1.3. Facilities for the Production of Hydrofluoric Acid

3.17d.1.3.1. The following special requirement shall be imposed:

As an exception to 2.3.4.2, in those cases in which the mass flow of hydrogen fluoride from the facilities for the production of and filling of containers with hydrofluoric acid and residue preparation amounts to a total of 150 g/h or more, the emission of hydrogen fluoride in waste gas shall not exceed the emission limits indicated in the graph (Fig. 11).

3.17d.1.3.2. Reference is made to 2.3.3.1, 2.3.3.4, 2.3.3.5.3 and 2.3.3.5.5.

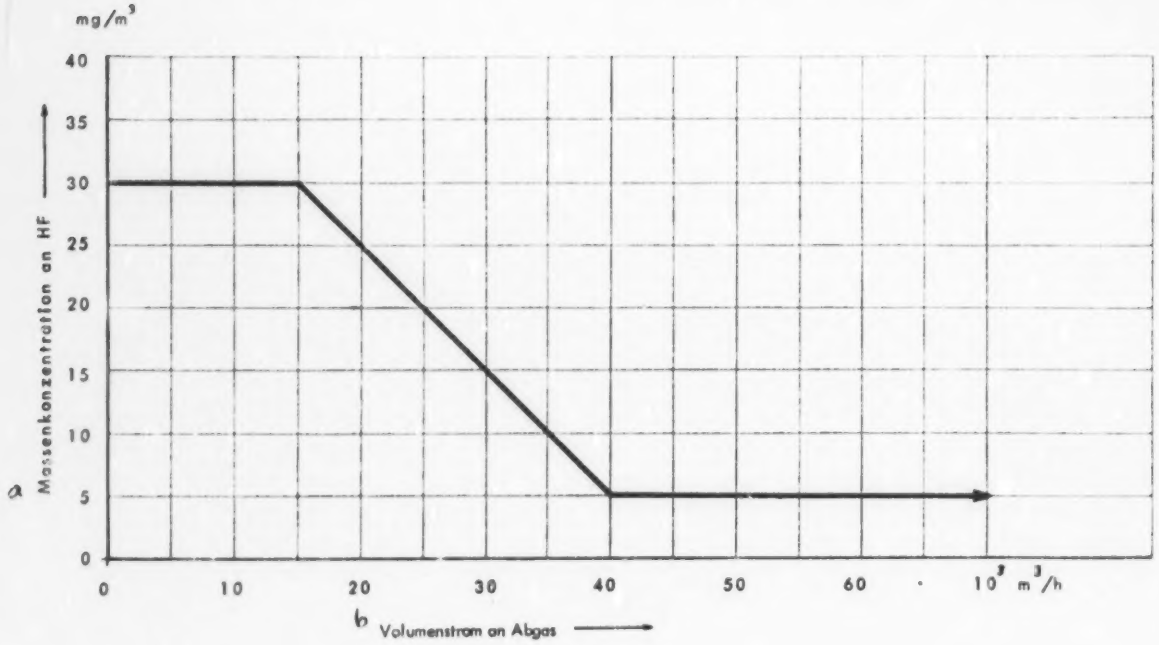


Fig. 11.

Key: a. Mass concentration of HF
b. Volume flow of waste gas

3.17d.3. Facilities for the Production of Sulfur

3.17d.3.1. Plants Using the Claus Method

3.17d.3.1.1. The following special requirements shall be imposed:

a) The conversion efficiency of Claus systems shall be at least 98%; Claus systems shall be controlled with the aid of process gas chromatographs;

b) Waste gases bearing hydrogen sulfide shall be fed through an afterburning system; waste gas from the afterburning system shall have a minimum outlet temperature of 800°C; hydrogen sulfide emissions shall not exceed 10 mg/m^3 in the waste gas from the afterburning system;

c) As an exception to Sections a and b, minimum efficiency shall be 97% in Claus systems which are operated in conjunction with natural gas preparation systems; hydrogen sulfide emission from the afterburning system shall be limited as much as feasible;

d) If sulfur dioxide emission exceeding 1 t/h is to be expected with the use of afterburning, the mass flow of hydrogen sulfide upstream from the afterburning system shall be reduced as much as possible by additional means, e.g. by conversion into elementary sulfur or sulfuric acid, or the waste gas from afterburning shall be desulfurized to an equivalent degree.

3.25. Facilities Under No. 25:

3.25.1. Facilities for the Production of Fiberboards or Particle Boards

3.25.1.1. As an exception to 2.3.3.1 and 2.3.3.2, the following special requirements shall be imposed:

a) Dust emissions in the waste gas from pulping operations and chip-conveying systems shall not exceed 50 mg/m^3;

b) Dust emissions in the waste gas from chip-drying systems shall not exceed 150 mg/m^3;

c) Dust emissions in the waste gas from other wood working and processing operations shall not exceed the emission limits indicated by the graph (Fig. 12).

3.25.1.2. Section 2.3.4.3 shall not be applied; emissions of total carbon in combustible organic materials in the waste gases from particle board presses shall be limited to 20 mg/m^3 if feasible, however.

3.25.1.3. Reference is made to 2.3.3.5.1 and 2.3.3.5.5.

3.25.1.4. The technology of the facilities and means for reducing emissions are presented in VDI Guideline VDI 3462 of March 1974.

3.27. Facilities Under No. 27:

3.27.1. Facilities for the Distillation or Refining of Petroleum and Petroleum Products (Mineral Oil Refining)

3.27.1.1. The following special requirements shall be imposed:

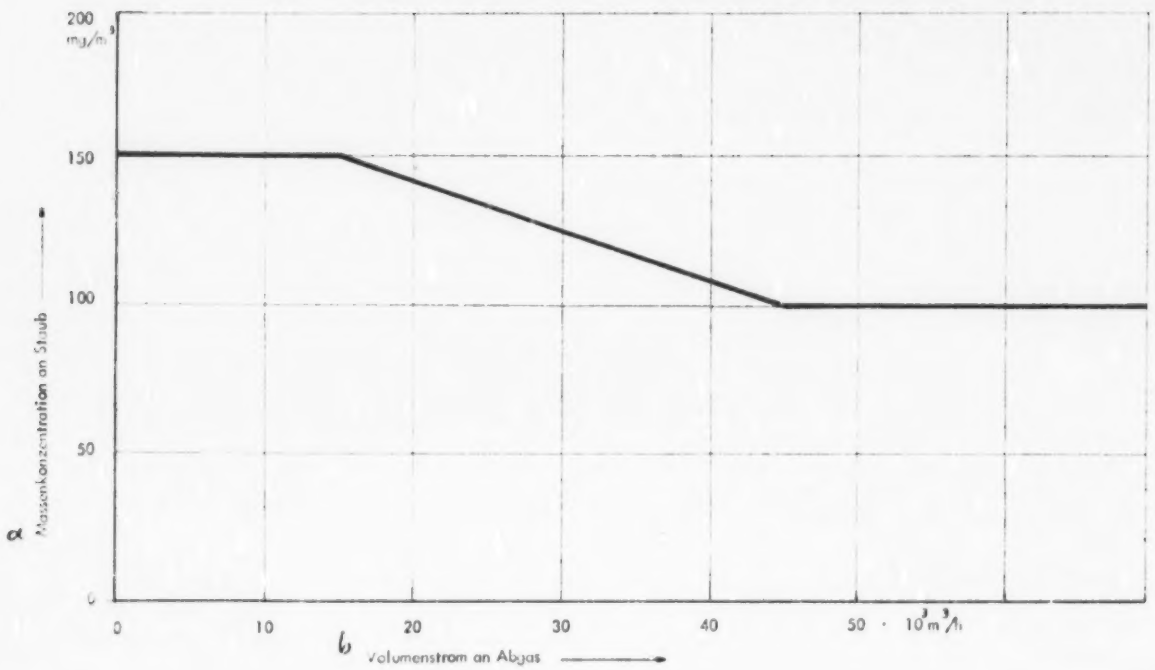


Fig. 12.

Key: a. Mass concentration of dust
b. Volume flow of waste gas

a) Floating-top tanks or fixed-top tanks with connections to the refinery gas line or systems equivalent to these methods shall be provided for crude oils and refining products with a vapor pressure greater than 13 mbar at a temperature of 20°C; floating-top tanks shall be equipped with effective seals around the edges; if materials with toxic properties which are volatile under storage conditions are stored, e.g. benzene, or materials with particularly low odor thresholds, e.g. contaminated scrubbing solutions or pyrolytic gasoline, or -- if a check made in individual cases indicates the necessity of this -- if materials are stored which contain toxic substances, fixed-top tanks shall be equipped with forced ventilation and the gases produced shall be safely fed to the gas collecting system or effectively eliminated by burning; if they are burned, the combustion products shall be dispersed in accordance with 2.6;

b) Flange connections shall, as a rule, be used only in those cases in which they are necessary from the standpoint of production engineering, safety engineering or maintenance; when pipelines and equipment are used in which toxic or particularly strong-smelling materials are transported or processed, high-grade seals (e.g. ring joints, welded ring seals) shall be used on flange connections; spindle holes for valves and gates shall in these cases be sealed with bellows followed by safety stuffing boxes or the equivalent;

c) Gases and vapors which escape from pressure relief fittings and blow-down systems shall be safely fed to the gas collecting systems; this shall not apply if it can be shown that a pressure buildup can occur as the result of polymerization or similar processes; the collected gases shall be burned in process furnaces wherever feasible; safety valves on storage vessels for liquefied nontoxic gases may vent into the open air;

d) Pumps with small leakage losses shall be used for conveying materials which fall under hazard class A I and exhibit an upper boiling point of up to 200°C; these include pumps with double-action slide-ring packing or slide-ring packing followed by safety stuffing boxes, pumps with "split tube" motors and pumps with magnetic clutch drive;

e) Emissions which are continually produced by processing systems, strippers, etc., and emissions which occur during the regeneration of catalysts, inspection and cleaning operations shall be burned or precipitated to an equivalent extent by scrubbing or condensation;

f) Equipment shall be installed in which the gases produced during startup and shutdown of the facility can be utilized; a flaring tower shall be available only for emergency (e.g. electrical or steam supply failure, fire;

g) Gases which contain hydrogen sulfide shall be treated prior to removal in accordance with 2.6 by chemical conversion or combustion in such a manner that the hydrogen sulfide emissions do not exceed 10 mg/m^3 in the waste gas; gases with a hydrogen sulfide content of more than 0.4% by volume and with a hydrogen sulfide flow, by weight, of more than 2 t/day shall be processed in suitable systems (e.g. amine scrubber followed by Claus plant);

h) The escape of hydrocarbon-bearing emissions during the loading of crude, intermediate and final products with a vapor pressure above 13 mbar at a temperature of 20°C and of strong-smelling products of lower vapor pressure, e.g. bitumen, onto rail or road vehicles shall be prevented by suitable measures, e.g. gas compensation system, return of gases to refining system, aspiration and elimination by absorption, adsorption or combustion; in the case of combustion, the combustion products shall be dispersed in accordance with 2.6;

i) Processing water shall be fed into an open system only after its degassing; the gases shall be eliminated by scrubbing or combustion; in the case of combustion, the combustion products shall be dispersed in accordance with 2.6;

j) Excess ballast water shall be fed into the clarification plant in a closed system after treatment in accordance with Section i;

k) In sampling, the first running shall either be returned directly to the processing system, the tank, etc. in a parallel circuit or collected completely; the sampling points shall be encapsulated in such a manner that no emissions occur from them except during sampling;

l) If clarification sludge combustion is employed, the waste gases shall be subjected to afterburning if their temperature at the combustion chamber exit is not at least 900°C;

m) Emissions of organic gases and vapors shall, as a rule, not exceed 0.04% of the weight of processed crude oil in a refinery without further petrochemical processing; a maximum of 95% may be used as conversion efficiency for waste gas combustion with a ground flare and a maximum of 75% for a tower flare, unless special evidence indicates that the use of a higher efficiency value is permissible.

3.27.1.2. Reference is made to 2.3.4.3.

3.27.1.3. The technology of the facilities and means for combating gaseous emissions from mineral oil refineries are presented in VDI Guideline VDI 2440 of May 1967.

3.29. Facilities Under No. 29:

3.29.1. Facilities for the Dry Distillation of Hard Coal (Coking Plants)

3.29.1.1. The following special requirements shall be imposed:

a) Sulfur-free or partially desulfurized undergrate gas shall be used for heating the coke ovens; the concentration, by weight, of H_2S in the undergrate gas shall not exceed 1.5 g/m^3 and that of other sulfur-bearing compounds shall not exceed 0.5 g/m^3, each measured as an hourly mean;

b) The gases produced by filling the coke ovens in bulk feeding operation shall be fed completely into the crude gas or purified prior to dispersion into the atmosphere in such a manner that a filtering efficiency of at least 90% with respect to the emission of solids is maintained; when grading is used, the escape of filling gases shall be prevented e.g. by an

underpressure in the gas collection area or by sealing of the grading opening; in coke ovens with tamping operation, a separation efficiency of 90% shall be maintained if feasible;

c) As an exception to 2.3.2, plume grayness may exceed number 2 on Ringelmann's chart for brief periods when heating is being changed and when the coke ovens are being filled; it shall nevertheless be lighter than grayness 3;

d) As the coke is being pushed out, the waste gases produced shall be collected and dedusted;

e) The machinery for operating the coke oven shall be equipped and operated with systems for cleaning the sealing surfaces on the oven doors and door frames;

f) Quenching towers shall be laid out with regard to shape, cross section and height in such a manner that the discharge rate of the quenching vapors is as low as possible; the quenching towers shall be equipped with auxiliary nozzles and internals; no waste water -- except for recirculating water from the quenching process -- which contains organic compounds shall be used for quenching;

g) The operator shall establish measures for emission abatement in coke oven operation in a special operating manual, particularly so as to guarantee the tightness of all openings, to eliminate all leaks, to ensure that only completely roasted coke is pushed out, and to avoid the escape of unburned gases into the atmosphere.

3.29.1.2. The requirements placed on facilities in the category of coking byproducts plants shall be based on the provisions established for facilities of this type in these Technical Instructions (cf. facilities under Nos. 17,

27); if ammonia combustion is employed, the waste gas shall be fed into a sulfuric acid or sulfur recovery system if hydrogen sulfide components are present in addition to ammonia.

3.29.1.3. Reference is made to 2.3.3.2, 2.3.3.5.1, 2.3.3.5.2, 2.3.3.5.4 and 2.3.3.5.5.

3.29.1.4. The technology of the facilities and means for reducing emissions are presented in the following VDI Guidelines:

VDI 2110 of March 1973 -- Sulfur Dioxide, Coke Oven Waste Gases

VDI 2302 of August 1970 -- Filling Coke Ovens

VDI 2303 of November 1966 -- Quenching Coke

VDI 2100 of August 1962 -- Screening, Crushing and Grinding Plants

3.33. Facilities Under No. 33:

3.33.2. Facilities for Preparing Bituminous Roadbuilding Materials and Tar-Coated Chips

3.33.2.1. The following special requirements shall be imposed:

a) As an exception to 2.3.2.1, dust emissions shall not exceed 100 mg/m^3 in the waste gas (f) from drying drums, referred to a CO_2 content, by volume, of at least 4% and of 12% referred to the production of fine asphaltic concrete with a high chip content, produced from an unwashed mineral mixture with a mass content of grain sizes up to 0.09 mm diameter [sic]; if feasible, emissions shall be limited to 75 mg/m^3 in waste gas (f);

b) The waste gases shall be discharged through a stack with a height of at least 12 m above the immission level; 2.6 remains unaffected;

c) The furnaces shall only be operated with gas fuels or heating oil EL with a maximum sulfur content of 0.5% by weight.

3.33.2.2. Section 2.3.4.3 shall not be applied; the escape of binder vapors from containers, mixers, etc. before or during preparation shall be prevented, however.

3.33.2.3. Section 2.3.3.5.4 shall not be applied to roadways for mineral materials in the production facility.

3.33.2.4. Reference is made to 2.3.2, 2.3.3.5.1 and 2.3.3.5.5.

3.33.2.5. The technology of the facilities and means for reducing emissions are presented in VDI Guideline VDI 2283 of July 1967.

3.35. Facilities Under No. 35:

3.35.1. Facilities for the Production of Hard-Burned Carbon or Graphite by Firing, e.g. for Electrodes, Current Collectors or Instrument Components

3.35.1.1. The following special requirements shall be imposed:

a) As an exception to 2.3.3.1, dust emissions shall not exceed 150 mg/m^3 in the waste gas, referred to a CO_2 content of 8% by volume;

b) The emission of total carbon in combustible organic materials shall not exceed 250 mg/m^3 in the waste gas from furnaces, referred to a CO_2 content of 8% by weight, measured by the silica gel method; the emission of tar components shall not exceed 50 mg/m^3 in the waste gas, measured at a temperature of 70°C;

c) The waste gases from mixing plants in which pitch, tar or other volatile binders or fluidizing agents are processed at elevated temperature shall be fed into an afterburning system; emissions of total carbon in combustible organic materials shall not exceed 100 mg/m^3 in the waste gas from these facilities;

d) As an exception to 2.3.2, the grayness of waste gas plumes shall be lighter than number 1 on Ringelmann's chart.

3.35.1.2. Reference is made to 2.3.3.4 and 2.3.3.5.

3.41. Facilities Under No. 41:

3.41.1. Facilities for the Production of Glass

3.41.1.1. The following special requirements shall be imposed:

a) As an exception to 2.3.3.1, dust emissions shall not exceed 150 mg/m^3 in the waste gas;

b) As an exception to 2.3.4.2, gaseous emissions of inorganic fluorine compounds, given as F^-, shall not exceed 15 mg/m^3 in the waste gas from glass furnaces.

3.41.1.2. Reference is made to 2.3.2, 2.3.3.2, 2.3.3.5.

3.47. Facilities Under No. 47:

3.47.1. Facilities for Keeping Layer Hens, Fattened Fowl or Swine

3.47.1.1. The following special requirements shall be imposed:

a) The facilities shall not be constructed close to residential areas; as a rule, a distance of 500 m shall be maintained; in particular, the animal-keeping methods, quantity of stock and ventilation shall be taken into consideration in determining this distance;

b) Emissions of dusts and odors in the waste air from pens shall be avoided as much as feasible by regulating air temperature, relative humidity and air flow;

c) Waste air shall be discharged above roof level in compliance with 2.6.1;

d) In the case of liquid or liquefied manure, an odor seal shall be installed between the pen area and external sewers or pits; liquid manure shall be stored outside the pens in containers such that annoyance due to odors cannot occur; solid manure shall be stored on a paved manure platform with drainage into a closed liquefied-manure pit;

e) Manure storage facilities shall be dimensioned in such a manner that the manure produced during at least 3 months can be stored; if, in conjunction with Section h, evidence can be provided that a shorter storage period is feasible, this shall be the basis for dimensioning the storage facility;

f) Manure loading areas shall be paved and shall have a gradient toward the inlet to a closed pit;

g) Liquid manure shall be distributed in tightly closed vessels; when spread on the ground, it shall be immediately worked in; only liquid manure treated with ventilation or the equivalent shall be spread at a distance of less than 500 m from residential areas;

h) It shall be demonstrated that § 15 of the Waste Disposal Act of June 7, 1972 (Federal Law Gazette I, p. 873), as last amended by the Federal Immissions Control Act, is being observed when manure is disposed of on areas used for agricultural, forest or garden purposes;

i) If the manure is not disposed of as described in Section h, the manure shall be worked up in suitable facilities, e.g. composting facilities (3.2.3), manure drying facilities (facilities under No. 49) or clarification plants.

4. Transitional Provision

As an exception to 2.4, the following immission values shall apply to dust precipitation, hydrogen fluoride, sulfur dioxide and hydrogen sulfide

for a transition period of four years after publication of this General Administrative Regulation:

Type of Immission	IW 1	IW 2
Dust precipitation in $g/(m^2 \cdot d)$	0.50	1.0
Hydrogen fluoride in mg/m^3 -- given as inorganic gaseous fluorine compounds	0.0030	0.0060
Sulfur dioxide in mg/m^3	0.140	0.50
Hydrogen sulfide in mg/m^3	0.010	0.020

Bonn, August 28, 1974

The Vice-Chancellor

Genscher

The Minister of the Interior

Maihofer